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GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS. VOLUME 7. PROJECTING COUNTY EMISSIONS

SECOND EDITION

Environmental Protection Agency

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Booz-Allen and Hamilton, Incorporated

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16. ABSTRACT

This report defines a specific and uniform methodology to upgrade existing emission inventories and to forecast future emissions of air pollutants within small geographical areas (e.g., county). The techniques presented are designed to be used by State and local air pollution control personnel in compiling baseline data for the State plans to maintain National Ambient Air Quality Standards. The expected schedule for submission of these plans to EPA is June 1975.

An earlier version of this report was published in September, 1974. This second edition provides expanded treatment of each of the three inventory/forecast levels and contains a new section dealing with the estimation of future emissions, particularly those from sources which may be governed by a Federal New Source Performance Standard.

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GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS

VOLUME 7:

PROJECTING COUNTY EMISSIONS

SECOND EDITION

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, N.C. 27711

January 1975

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The guideline series of reports is being issued by the Office of Air Quality Planning and Standards (OAQPS) to provide information to state and local air pollution control agencies; for example, to provide guidance on the acquisition and processing of air quality data and on the planning and analysis requisite for the maintenance of air quality. Reports published in this series will be available - as supplies permit - from the Air Pollution Technical Information Center, Research Triangle Park, North Carolina 27711; or, for a nominal fee, from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

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FOREWORD

This document is the seventh in a series comprising Guidelines for Air Quality Maintenance Planning and Analysis. The intent of the series is to provide State and local agencies with information and guidance for the preparation of Air Quality Maintenance Plans required under 40 CFR 51. The volumes in this series are:

Volume 1: Designation of Air Quality Maintenance Areas
Volume 2: Plan Preparation
Volume 3: Control Strategies
Volume 4: Land Use and Transportation Considerations
Volume 5: Case Studies in Plan Development
Volume 6: Overview of Air Quality Maintenance Area Analysis
Volume 7: Projecting County Emissions
Volume 8: Computer-Assisted Area Source Emissions Gridding Procedure
Volume 9: Evaluating Indirect Sources
Volume 10: Reviewing New Stationary Sources
Volume 11: Air Quality Monitoring and Data Analysis
Volume 12: Applying Atmospheric Simulation Models to Air Quality Maintenance Areas
Volume 13: Allocating Projected Emissions to Subcounty Areas

Additional volumes may be issued.

All references to 40 CFR Part 51 in this document are to the regulations as amended through July 1974.

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I. INTRODUCTION

In Chapter I, a general introduction to the content and approach of the manual is given. It is recommended that this chapter be read before the emission inventory update and projections are begun. This chapter is divided into the following sections:

1. Purpose of the manual
2. Scope of the emission projections
3. Summary of the general approach used in the manual
4. Structure of the manual
5. Emission source categories
6. General instructions
7. Estimating future emissions
8. Project organization and planning
9. Glossary of terms.

1. PURPOSE OF THE MANUAL

The purpose of this manual is to provide a set of specific procedures for estimating future air pollution emissions from point and area sources in an individual county or in any comparatively small geographic area. A uniform output format is proposed which enables the results from a number of counties to be aggregated to the SMSA or AQCR level. Since future emissions are determined by the level of activity in the county, the pollution projections are based on estimates of economic and demographic growth. These projections are developed for each specified county and are established independently of potential growth in emissions from neighboring counties. In addition, the impact of emission abatement regulations and compliance schedules is included in the calculation of net emissions.

The results of the projections made in accord with the procedures given in the manual are intended to be used as an input to the EPA Air Quality Maintenance Area (AQMA) program. The manual may also be used for a number of other purposes:

- To identify regions not already designated as candidate regions for air quality maintenance programs

- To indicate whether a region may be in danger of failing to meet ambient air quality standards in the future

- To evaluate the effect of proposed AQM strategies.

2. SCOPE OF THE EMISSIONS PROJECTIONS

Annual emissions of the five criteria pollutants — particulates, sulfur oxides, nitrogen oxides, carbon monoxide, and hydrocarbons — can be estimated using the procedures specified in this manual. The calculations outlined will provide baseline emissions and projections of pollutant emissions for any three projection years. The baseline year can be any calendar year for which data exist sufficient for determining baseline emissions. Five-year projection intervals are recommended because smaller time increments would require additional effort without a significant increase in accuracy, while larger time increments would degrade the validity of interpolation techniques for the intervening years if information for intervening years is desired. The only situation in which such an interpolation procedure could introduce estimating errors is when a large point source is introduced at some intermediate year or when pollution control regulations come into effect for some intervening year and drastically affect total allowable emission for the geographical area. These cases are specifically treated in the forecasting methodology. Growth projections developed at the county level covering a time period greater than 15 years would be increasingly inaccurate, so that their utility to the AQMA program would be questionable.

The output of the projections described in this manual will be estimates of net annual emissions in the five criteria categories, presented in the standard National Emission Report (NER) format. This format provides for disaggregation of sources into the following primary categories:

- Fuel combustion (point and area)
- Industrial process (point) (13 industrial categories)
- Transportation (area)
- Solid waste disposal (point and area)
- Miscellaneous (point and area).

Forecasts are for net pollutants discharged in the county and include the effect of equipment control efficiency, control regulation deadlines, and schedules of compliance to those regulations.

The manual does not provide a procedure for estimating air quality directly. Air quality modeling involves four additional factors: contribution of pollutants from neighboring counties; geographic distribution of sources within the region; modeling of meteorological dispersion of pollutants; and photochemical reaction of pollutants. Although air quality is not specifically treated herein, there is no reason that the data developed and projections made using this manual could not be used as an input to a regional air quality model. In this case, the input requirements for air quality studies would be better served by using point source specific data developed in following the procedures given in the manual rather than the aggregated NER format totals. Such detailed data includes geographic location, stack data, and daily and seasonal variation in emissions. If air quality modeling will be done, the base year for emissions should be the same as the base year for air quality data.

In completing the calculations specified in the manual, certain assumptions concerning future growth must be made. On occasion, the manual specifies assumptions or constraints which may result in projections of a faster rate of growth than would be considered most probable. Assumptions of this type may produce future emission levels which from an air quality standpoint would be pessimistic. However, projections of "worst case" growth within reasonable limits ensures that a maintenance program is instituted whenever there is reasonable concern that a region might exceed emissions standards at some time in the future.

3. SUMMARY OF THE GENERAL APPROACH USED IN THE MANUAL

The manual provides estimating procedures to be completed by county or other local government representatives. A limited familiarity with air quality data analysis and analytic techniques such as graphical extrapolation and curve fitting is presumed. The emphasis in both the development of the projection methodologies presented in this manual and translation of these methodologies into a coherent set of manual instructions has been on simplicity and clarity with a minimum sacrifice of validity.

The manual has been designed specifically to provide for local initiative and data input. This is an extremely valuable feature for a number of reasons. The personnel at the county level responsible for completion of the manual will in many cases have most immediate access to some of the best data for making growth projections. Local data can be used when the user feels them to be more accurate or timely than published state or national data. There is great variation among counties as far as type and depth of data and projections available; the user is encouraged to use the references he feels are most appropriate, even if they are not cited explicitly in the instructions. There is also provision for substitution of local emission factors for those published by EPA. For future reference, the titles and dates of the references consulted should be documented in the space provided in the tables. Complete documentation of references, calculation methods and assumptions is imperative for interpretation of the projection results.

The provision for local initiative imposes on the user the responsibility to perform the calculations and data analysis in a very careful way. The emission projections provided by the manual will be most valid if the user does not routinely follow the instructions, but rather queries their validity and improves on them when appropriate.

In some cases, alternate projection methods are specified; those producing substantially more accurate results are identified. If the user, based on knowledge of his county and its character, prefers one method, he should use it. Alternate methods can also be used as a check.

While emission projections can be completed using hand calculations only, the use of computerized data processing is encouraged if resources permit. The manual methodology is deliberately general in order to be potentially useful to any county in the country. There is a wide disparity among counties with respect to number, type and location of emission sources and their expected growth patterns. As a result, some estimating techniques discussed herein will not be applicable to every county.

The manual is a complete and independent document in the sense that all the steps required to generate emissions estimates are explicitly defined, the sources to be consulted for input data are specified, and a complete set of forms and tables is enclosed for reference.

Parameters and data to be recorded in this manual reflect the total activity for the entire calendar year (e.g., tons emitted by a source per calendar year). There is no provision in the manual for differentiation in time among events or activities in the same year. All data used for a given calendar year should be averaged to give the mean status of that calendar year.

In addition to the great variety of emission characteristics among counties, it is anticipated that there will be a significant variation among counties in level of effort and resources available to generate these projections. Consequently, projection techniques for the various source categories are specified which involve different levels of effort and manpower requirements. In this way, more resources can be focused on these categories which are major pollution sources in the county, and proportionately less effort need be expended on minor sources. Such resource allocation is essential to maximize the validity of the projections within time and manpower constraints.

Predicting air pollution emissions involves three distinct tasks:

- Determining as accurately as possible the baseline of emissions levels on which projections will be based
- Estimating growth patterns for those economic and demographic parameters (e.g., industry output, population, vehicle miles) which are related to emissions
- Determining the relationship between activity levels projected and the actual emissions produced, as limited by pollution controls.

The first task requires a systematic update of the National Emissions Data System (NEDS) inventory of point and area sources in the county, or the local emissions inventory if no NEDS data exists, to ensure that the base year inventory is current and complete. Since growth is expressed as an increase or decrease in the baseline activity levels, the emission projections can only be as accurate as the data on which they are based. The second task, estimating growth patterns, is based on intracounty information, such as historical trends, specific industrial growth plans, and land-use plans and controls. The county is treated as an independent entity in an economic sense. There are a number of distinct advantages associated with such a projection technique which builds up from the county level. It is based in large part on local information (much of which might be unpublished and unofficial), which in many cases can provide the best estimates of local growth. Since the projections are to be made by local or regional officials, with knowledge of local practices, the opportunity has been provided to override emission factors or other standard statistics, and to use parameters or data which are considered more accurate for their jurisdiction. The third task, relating projected activity levels to net emissions, requires a review of all laws and regulations that apply to any sources in the county. The effect of emission controls is quite significant in forecasting emission levels, because while activity growth for many sources will remain below five or ten percent per year, control regulations may require a decrease in emissions of 50 percent or more.

The projections developed using this manual should be considered indicators of future emissions levels and not as firm certainty because of the sensitivity of the projections to input data and assumptions. It is recommended that ranges of potential input variables be considered to test the sensitivity of the projections to key assumptions.

At the present time a field test of the manual is being planned. This will involve completing the data update and projections for the Baltimore, Maryland AQMA. The results and interpretation of this test will be published as an additional chapter to the manual: Chapter V, Example Case Study.

4. STRUCTURE OF THE MANUAL

The manual contains four chapters:

- I - Introduction
- II - Data Sources
- III - Emission Inventory Update Procedures
- IV - Forecast Procedures.

Chapter II provides a discussion of the three categories of data sources which are to be used in the calculations:

- EPA documents and emission inventory data from the National Emission Data System (NEDS)
- Local studies, reports and data, published by city, county, metropolitan area or state
- Federal agency reports which may include state or county data, but differ from local studies in that the data are kept uniformly for all geographic divisions.

Specific instructions are provided in this chapter on how to obtain the required data sources.

In Chapter III, procedures for updating the emission inventory for the county are given. Throughout the manual emphasis is placed on NEDS point and area source inventory data in the determination of baseline emissions. This data base is valuable especially for point source emissions, because the number of individual point sources, even in an area as small as a county, can be quite large. The area source data in the NEDS file are usually based on general calculations, rather than detailed local surveys.

The accuracy of the NEDS data presently in the National system can vary for a number of reasons:

- The point source inventory may be incomplete with some major sources omitted
- The area source data may not have been based on the best data which may be available at the local level
- The data may not be valid for the present year.

If the NEDS data base is to be used only qualitatively to identify major emission source categories, the question of accuracy is not critical. If the NEDS data base is to be used quantitatively for detailed emission projections, however, an update of the NEDS data must be considered. Extreme care must be taken that the level of detail chosen to update NEDS will produce data superior to that already in the system.

Instructions are included in the handbook for a substantial expenditure of effort to update and improve the inventory of point sources, and especially area source data. These calculations will also provide a means of improving the accuracy of the NEDS file, and a means of keeping the NEDS information current as required under the State Semi-Annual Reporting requirements. Whenever the calculations produce a NEDS update, the appropriate NEDS data processing coding forms should be completed as specified by EPA document APTD-1135 and submitted to the state pollution control agency for their certification and subsequent transfer to EPA. In the event that no NEDS data exists for the region in question, the emission inventory system used locally in that region may be substituted for NEDS for the purposes of this manual.

Chapter IV contains the instructions for predicting future county emissions. With respect to the validity of the projections developed through use of this manual, there are a number of factors which should be considered:

- Effort Required in Preparing Projections - The instructions provide for a variable level of effort and resource commitment in making emission projections. The confidence placed in the projections should be proportional to the amount of effort expended in preparing them.

- Projections for Larger Than County Areas - The manual has been designed to be used at the county level because the county is the smallest geographic area for which uniform activity and consumption data are usually available. Economic growth projections are ordinarily developed for larger areas (such as states) since state growth, because of the "law of large numbers," is considered more predictable. If projections are desired for larger geographic areas based on the methodology presented herein, they can be obtained directly by considering the larger area in its entirety, rather than projecting for each county and aggregating the results. This approach will minimize the effect of intraregional shifts in industry and population.

- Verification of Projections for Larger Areas - It is always desirable to compare emission projections aggregated from a number of counties to projections for larger geographic areas. Such geographic areas would include the AQCR, SMSA or state. This comparison is especially valuable if all the counties within the area are required to submit emissions projections.

5. EMISSION SOURCE CATEGORIES

Chapters III and IV are devoted to baseline emissions calculations and future emissions calculations, respectively. A summary list of data sources recommended for completion of the calculations is included in the first section of each chapter. The remaining sections describe how to calculate base year or future emissions for each of the following source categories:

- Industrial processes
- Fuel combustion
- Transportation
- Electricity generation
- Incineration
- Miscellaneous.

In each chapter procedures are given for aggregating base year and projected emissions from the various source categories into the standard NER format (Tables 7.1 and 7.2 in the Appendix).

The relationship between the manual emission source categories and the corresponding NER sectors is as follows:

Manual Emission Source Categories (In the order presented in the manual)	NER Emission Source Categories (Tables 7.1 and 7.2 in the Appendix)
Industrial Process	Industrial Process
Fuel Combustion	
1. External combustion	Fuel combustion, external
2. Internal combustion	Fuel combustion, internal
Transportation	
1. Highway vehicle	Transportation, land vehicles, light/heavy vehicles
2. Off-highway	Transportation, land vehicles, off-highway
3. Rail	Transportation, land vehicles, rail
4. Vessels	Transportation, vessels
5. Aircraft	Transportation, aircraft
Electric Generation	Fuel combustion, external and internal

Incineration	Solid waste disposal
Miscellaneous	
1. Evaporation	
- Gasoline	Transportation, gas handling losses
- Solvents	Miscellaneous
2. Other	Miscellaneous

(1) Industrial Process

This section deals with point sources categorized under industrial process emissions. Industrial fuel combustion is not included in this category.

Emission factors for process emissions are given in terms of levels of output or production, and in many cases are functions of industrial process used to produce that output. There are thirteen subcategories of industrial process emissions:

- Chemical manufacturing
- Food/agriculture
- Primary metals
- Secondary metals[1]
- Mineral products
- Petroleum industry
- Wood products
- Evaporation
- Metal fabrication
- Leather products
- Textiles
- Inprocess fuel[2]
- Other.

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[1] If a local emission inventory is substituted for NEDS, emission data for secondary metals processes may be included in the data for primary metals.

[2] Inprocess fuel is fuel that undergoes combustion in the same chamber with process contaminants and both process contaminants and combustion products are discharged in combination. If a local emission inventory is substituted for NEDS, emission data for this category may not be directly available.

The probable growth rates for each of the above subcategories are available from disaggregated national data (e.g., OBERS). Each subcategory, however, is comprised of many individual, different processes. Therefore, it is logical to assume that each process within the county will be reviewed on an individual basis and the emissions calculated separately. This requires a detailed point source inventory for the entire geographical area.

Future industrial emissions are estimated by determining as accurately as possible:

- Output changes for existing plants, or expansion of existing facilities
- Process changes
- Changes in pollution control efficiencies
- Relocation of new industries in the county which were not present during the baseline year.

The quantitative methods for estimating growth given in Chapter IV focus only on the first three factors. The mandatory State Semiannual Report to EPA requires that NEDS data for new plants under construction be submitted to EPA. This reference should be consulted concerning relocation of new plants in the county in the near future. The best sources of data on new plants in the distant future would be the county industrial zoning board or a similar state agency which might be able to identify new industries expected to locate in the county. Methods for determining activity changes for existing plants are suggested in the Chapter IV instructions.

(2) Fuel Combustion

This section deals with emissions (both point and area source) due to the direct combustion of fuels. External combustion refers mainly to boilers. Internal combustion refers to stationary, off-highway equipment, such as gas turbines and reciprocating engines.

Emission factors are given in terms of the fuel burned. The fuels which are considered include:

- Major fuels:
  - Coal (anthracite, bituminous, lignite)
  - Heating oil (distillate, residual)
  - Natural gas
- Minor fuels:
  - Process gas
  - Coke
  - Wood
  - LPG
  - Bagasse
  - Other.

(3) Transportation

The following sources are considered in estimating emissions resulting from transportation activity:

Highway vehicles: There are five types of such vehicles which are the major sources of pollution:

- Light-duty gasoline (LDV), automobiles, which account for most transportation emissions
- Light-duty gasoline trucks (LDT); these are less than 8500 pounds gross weight
- Heavy-duty gasoline (HDV); these are greater than 8500 pounds gross weight
- Heavy-duty diesel (HDD)
- Gasoline motorcycles (MC).

Emission factors for all vehicles are given in terms of grams of pollutant per vehicle mile. Emissions from the five above types can be aggregated into NER format as follows:

NER Category	Vehicle Type
Light-duty gasoline	Light-duty gasoline (LDV) Light-duty trucks (LDT) Motorcycles (MC)
Heavy-duty gasoline	Heavy-duty gasoline (HDV)
Heavy-duty diesel	Heavy-duty diesel (HDD)

- Off-highway mobile sources: Emission factors are given in terms of fuel use.
- Rail locomotives: Emissions are proportional to fuel use.
- Vessels: Just as for the above sources, emissions are given in terms of fuel use.
- Aircraft: Emission factors are specified in terms of the landing-takeoff cycles (LTO), and by aircraft type.

(4) Electricity Generation

This category covers point source emissions from electricity generation by power utility companies. Both internal and external combustion equipment are considered. Although the emissions from these sources are substantial, the estimation of present and future emissions is made easier by the fact that comparatively good fuel data is kept for power plants, and growth is planned well into the future. Emission factors are given in terms of quantity of fuel burned and the sulfur and ash content of that fuel.

(5) Incineration

This section includes point source emissions from government incineration (which means any large-scale operation by federal, state, municipal or local government); point and area source emissions from industrial and commercial/institutional incineration; and residential area source incineration. The two primary disposal methods are open burning and on-site incineration; most other disposal methods, such as landfill, are replacing open burning and do not produce air pollution. Emissions are calculated from the tons of waste burned and not from the total amount of solid waste collected.

(6) Miscellaneous

This last section covers any other area sources not included in the other categories. These miscellaneous sources are characterized by intermittent emissions which may be substantial at times and are frequently regional in nature. There are four general subcategories of miscellaneous sources:

- Solvent evaporation
- Fires
- Airborne dust caused by human agitation
- Airborne dust caused by natural winds.

Based on data collected from air quality monitoring stations, it is becoming more apparent that emissions from miscellaneous sources are extremely important for some counties.

Two specific evaporative sources are considered in this section — hydrocarbon evaporation from the handling of gasoline (primarily at the retail filling station), and evaporation from the use of solvents (specifically in dry cleaning processes, surface coating operations, industrial solvent use not covered by point sources, and miscellaneous solvent use); evaporative emissions from industrial point sources and bulk gasoline terminals are considered under industrial processes. Emission factors are based on the amount of gasoline sold (in gallons) and the amount of solvent used (in tons).

Emission calculation procedures for the other miscellaneous sources are not included specifically in Chapters III and IV because procedures for estimating emissions from these sources are in the process of being modified and improved. The miscellaneous area source categories in Tables 7.1 and 7.2 have been expanded from the categories reported in the NEDS system and reflect the increasing importance associated with these sources.

The user is referred to the most recent edition of APTD-1135 for methods to estimate emissions from miscellaneous sources. Additional guidance and directives are being developed by EPA although the PEDCo and MRI reports referenced in Chapter II can be used as an interim guide for estimating fugitive dust emissions.

6. GENERAL INSTRUCTIONS

(1) Provision for Variable Level of Effort

In Chapters III and IV, three different levels of analysis are specified, both for baseline and forecast calculations.

- Level 1 - This level relies on data published by federal or state agencies, and does not involve interviewing or a review of special county studies, like land-use or transportation plans. It requires the least time, and hence cannot be expected to result in as accurate projections as the other levels. This level can be used for orientation and preparation for the other more complex levels.

- Level 2 - The methods specified at this level lead to projections of greater accuracy than those of Level 1, but usually would require more time to complete. It makes use of special data and studies done for the county, such as transportation or land-use plans.

- Level 3 - This level relies on extensive contact or interviewing with organizations responsible for the major pollution sources to determine present and future emissions. It is the level leading to the most accurate projections; but as a result, the professional effort required is greater than that needed to complete projections at the other levels.

It is recommended that Level 3 projections be used for all source categories if the results will be used in the AQMA program or as input to any other program directed at formulating important policy decisions. Maximum resources should be allocated for establishing a good baseline inventory and emission forecasts especially if costly pollution control programs will be based on such data.

(2) Allocation of Resources

The source categories in Tables 7.1 and 7.2 in the Appendix represent a summary of emissions in the county. For any given county, some categories may produce most of the emissions while others produce little or no emissions. Calculating emissions in an accurate but efficient manner requires allocating the appropriate effort and resources to each source category. As noted above, three distinct levels of effort are defined in the manual; this allows the establishment of an optimum allocation of resources to develop the basline inventory and to project emissions.

In Chapters III and IV, all source calculations involving the same level of effort are grouped together; this format was chosen for ease of use and was not intended to suggest that all sources be addressed at the same level. On the contrary, the most time-consuming but accurate calculations (e.g., Level 3) should certainly be carried out for the major emission sources with proportionally less effort (e.g., Levels 1 or 2) directed to minor or negligible sources. The relative importance must be considered in terms of the present emissions and the future activity if unusual growth is predicted.

The following categories are separated in Tables 7.1 and 7.2 in the Appendix:

- Industrial process
- External fuel combustion
- Internal fuel combustion
- Electric generation
- Light-duty gasoline highway vehicles
- Highway vehicles
- Off-highway vehicles
- Rail
- Vessels
- Aircraft
- Incineration
- Miscellaneous.

The NEDS report most useful for initially allocating resources needed is the county NER. This report gives the annual emissions for the county in the format specified in Tables 7.1 and 7.2. Emission from each of the categories listed above should be reviewed to determine which ones are or are likely to be major emitters in the county and thus should be the major focus of the projection effort. The general procedure to be used in performing such a determination is:

- Determine a threshold percentage (e.g., 5 percent) such that any source category with emissions less than that percentage of the total county emissions would be classified as minor, and considered using Level 1 or 2 techniques.
- Apply the threshold percentage to the NEDS NER report (specified in Chapter II) to determine which source categories are minor.
- Decide upon the level of effort to be expended on each of the categories classified as minor.

After the inventory updating procedures in Chapter III are completed, the finalized base year emissions in Table 7.1 can be used in the same way to allocate resources for the emissions projections of Chapter IV.

One additional factor which should be considered when allocating levels of effort to the various source categories is the potential significance of any errors which could result. Emissions from industrial processes or electricity generation, for example, might produce a situation where inaccurate forecasts would have a profound effect on the projected emission profile for the county.

7. ESTIMATING FUTURE EMISSIONS

(1) Introduction

Various methods for projecting change in activity level are outlined in the manual and there are a number of alternative procedures which are suggested. In most cases the "default" projection reference is the AQCR or SMSA growth factor from OBERS. *

All growth factors, regardless of whether they refer to population, fuel consumption or other parameters, are dimensionless and are normalized to unity for the baseline year. In this way, present activity can be scaled to produce future activity expressed in the same units.

At some points in the instructions, individual interviews are recommended to obtain baseline data and growth estimates. The primary benefit of such interviews, in addition to correcting gaps in the baseline data, is to identify major deviations from historic or normal growth patterns and to identify special factors influencing growth that cannot be determined from regional or national forecasts. While it is anticipated that most interviews will be conducted in person, telephone inquiries or mail questionnaires can also be used at the discretion of the manual user. Accuracy, compliance, and time should be considered in such cases. It must be emphasized that any interviews performed to upgrade the data base or to project emissions must be conducted under local or state legal authority.

While an interview program is an extremely valuable tool, there are three factors influencing growth which even a complete and extensive program will fail to quantify precisely:

- Drastic changes in industrial technology
- Unpredictable future developments (e.g., the national energy crisis)
- Specific location of major new industries within the county.

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* Regional projections of population, employment and earnings developed by the U.S. Departments of Commerce and Agriculture. A more complete description is given in Chapter II.

(2) Projection Techniques

The two general equations for calculating point [illegible]rce emissions are:

(Emission) = (Activity) x (Uncontrolled Emissio[illegible])
x (1 - Control Efficiency)

(Emission) = (Activity) x (Uncontrolled Emission Factor)
x (Sulfur/Ash Content) x (1 - Control
Efficiency)

These equations are as suitable for forecasting future emissions from a given point source as they are for calculating base year emissions. For process emissions the estimated activity level (e.g., throughput) for future years should ideally be forecast by the facility operating the process. If this is unsuccessful or impossible, techniques are specified in this chapter to determine future activity levels for individual processes by applying generalized industrial growth patterns (e.g., OBERS). The pollutant removal efficiency required for a given future year, however, cannot logically be obtained from the polluting facility since such a number is solely a function of the legal requirements placed on the source by the most stringent pollution control regulation. Thus, the values for future process control efficiencies and for future allowable ash/sulfur content must be calculated by the user directly from the most stringent control policies, regulations and compliance schedules. Anticipated emission reductions due to the most stringent applicable regulations should be converted into a single, equivalent control efficiency for each point source and/or SCC process. This control efficiency value for the process, one for each projection year, should also reflect the authorized timetable for achieving compliance with the regulation.

Uncontrolled emission factors for each SCC code are published in AP-42 and are independent from the control equipment actually installed in a given facility. These uncontrolled emission factors are inherent to each process and remain constant from year to year. Thus the same emission factor used for calculating base year emissions can be used in the equation for calculating emissions in the projection years.

The above method for estimating future emissions assumes that detailed information about activity level and compliance with control regulations is known for each point source and SCC process; in other words, a level three inventory update has been completed in accordance with the procedures in Chapter III. These details may not be available if only a level one or two update has been achieved. For such cases, a method is needed to "guesstimate" future emissions directly from the baseline emissions given in Table 7.1. Scale the baseline emissions for each industrial category directly by a dimensionless growth factor for that category, which includes the composite effect of expected change in activity level and change in required emission control. Procedures for developing the growth factors are specified later in this chapter. This simplified procedure applies only to point sources since all area source emissions are calculated directly from the activity level, the emission factor, and the sulfur/ash content.

(3) The Effect of New Source Performance Standards On Forecasted Emissions

The value for the future equivalent control efficiency to be "plugged into" the emissions equation is usually a function of the laws and regulations already agreed upon by the State agencies and EPA. There are, however, some industrial processes that are now, or are likely to be, subject to Federal New Source Performance Standards (NSPS). Some NSPS became effective in 1971 while others will be implemented in 1975. Still others will probably be in effect by 1980 or by 1985. Preliminary estimates of the emission reductions resulting from these promulgated and proposed NSPS have been tabulated by EPA for use in Air Quality Maintenance emission projections and can be obtained from the AQMA representative in each EPA Regional Office. This reference specifies either the required control efficiency (percent removal of uncontrolled emissions) or the maximum amount of pollutant allowed per unit of activity for each process likely to be affected by NSPS between 1974 and 1985.

Federal NSPS apply to the following industrial activities:

- New equipment installed in an existing facility

- Replacement of obsolete equipment within an existing facility

- All equipment in a new facility.

Federal NSPS do not apply to utilization of idle capacity, however.

Thus, three different situations can exist for an industrial process subject to NSPS:

- The entire facility is subject to NSPS

- Part of the production is subject to NSPS and no other laws affect the remaining production

- One part of the production is subject to NSPS and the remainder is subject to a local agency regulation.

Exhibit 1 depicts plant information for a source that is currently subject to a local regulation or compliance schedule and also will be subject to a NSPS in 1980. The objective of this example is to show, in general, how to estimate 1985 emissions when one portion of the 1985 source production will be subject to a NSPS and the remainder will still be subject to the local regulation. This method is also valid when the NSPS is the sole control regulation affecting the industrial process. Before constructing a graph similar to Exhibit 1, the following data must be collected for the point source under investigation:

- Production rate for the base year (obtained via interviews)

- Design capacity (obtained via interviews)

- Replacement rate of obsolete process equipment (obtained via interviews or assume twice equipment lifetime allowed by the Internal Revenue Service for tax purposes*)

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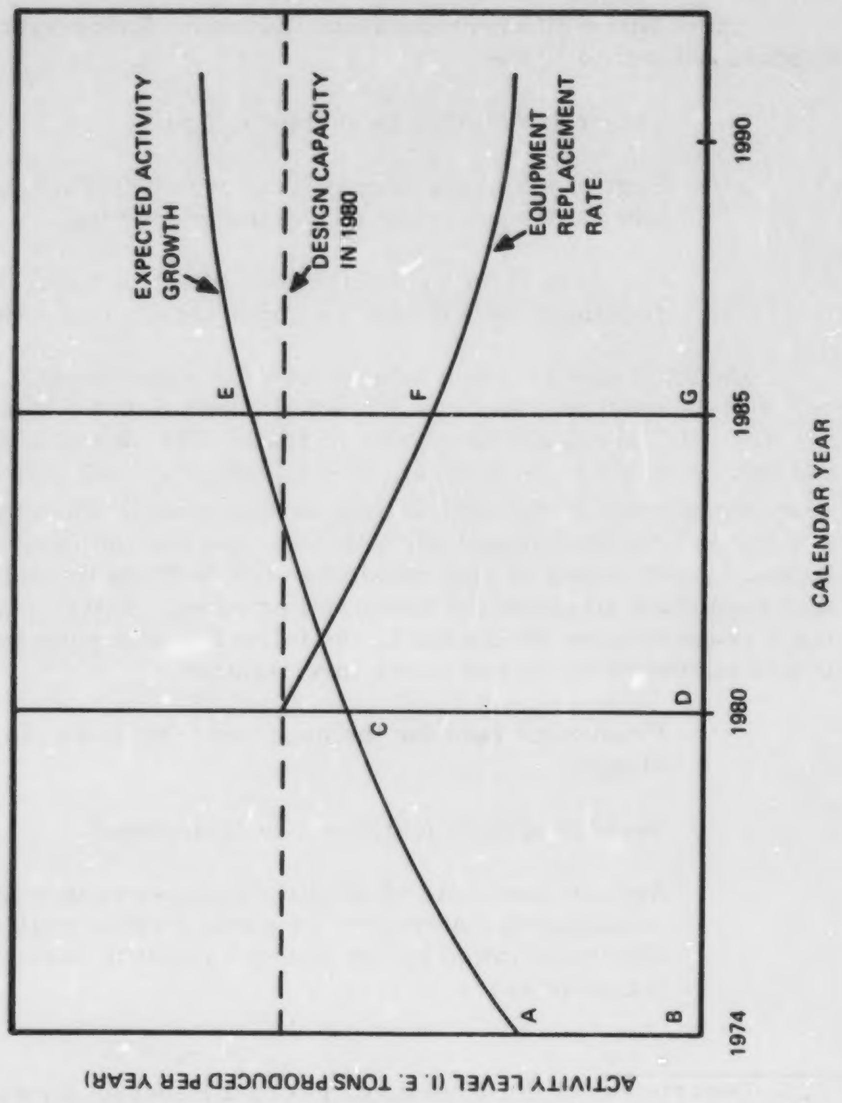
* U.S. Department of the Treasury, Internal Revenue Service, Depreciation Guidelines and Rules. Pub. No. 456, Washington, D.C., August 1964.

EXHIBIT 1
Sample Plant Projections



- Future activity growth rate obtained via interviews or from generalized growth projections (e.g., OBERS).

The following procedure was used to construct the graph in Exhibit 1:

- Draw a horizontal line representing the design capacity for the year in which the NSPS becomes effective
- Draw the expected activity growth pattern starting at the production level for the base year
- Draw a line representing the rate obsolete process equipment is replaced; start the line on the year that the NSPS becomes effective.

Line E-F represents the portion of 1985 production expected to be subject to the NSPS whereas line F-G represents 1985 production subject to the local regulations. Total 1985 emissions are calculated by inserting the appropriate activity values and required control efficiencies into the emission equation and summing the results.

It has been assumed in the above example that the proposed NSPS is more stringent in limiting emissions than the existing local regulations. If this is not the case, the local regulation should be applied to the entire 1985 production.

8. PROJECT ORGANIZATION AND PLANNING

Successful and efficient completion of both the update and projection calculations requires a well-organized management approach. This section is intended to assist both the project manager and the project staff in establishing the:

- Specific tasks which must be completed
- Interrelationship and time sequence of those tasks
- Approximate manpower resources estimated to be required for each task,

and in preparing a detailed management plan for conducting the projections analysis for their county.

The basic elements of a model management plan are presented, in schematic form, in Exhibit 2. The column on the extreme left of the exhibit, entitled, "Tasks," lists 19 specific tasks which must be completed; some of these are management tasks, some are technical or clerical in nature. The tasks are grouped according to the four general phases of the program.

Exhibit 2 also presents:

- A schematic representation of the approximate relative duration of each task, as shown by the length of the horizontal bars on the example schedule

- The approximate time sequence and interrelationship of the tasks.

Manpower estimates, divided into management, technical (including technical professionals and assistants), and clerical are to be entered at the right side of Exhibit 2. Completion of this manual requires inputs from all three skill categories and some tasks require a mix of these skills. For each task and for each skill category, space is provided to record the number of man-hours estimated to be necessary and, afterwards, the amount of effort actually expended.

The far right column of Exhibit 2 provides space to enter a check when each task is completed such that current status of the program can easily be monitored.

Large variations from county to county can be expected in the manpower requirements and duration of the emission inventory update (Chapter III) and the emission projections (Chapter IV). This is due to:

- Accuracy and timeliness of the NEDS data previously submitted to EPA under the semiannual reporting requirements

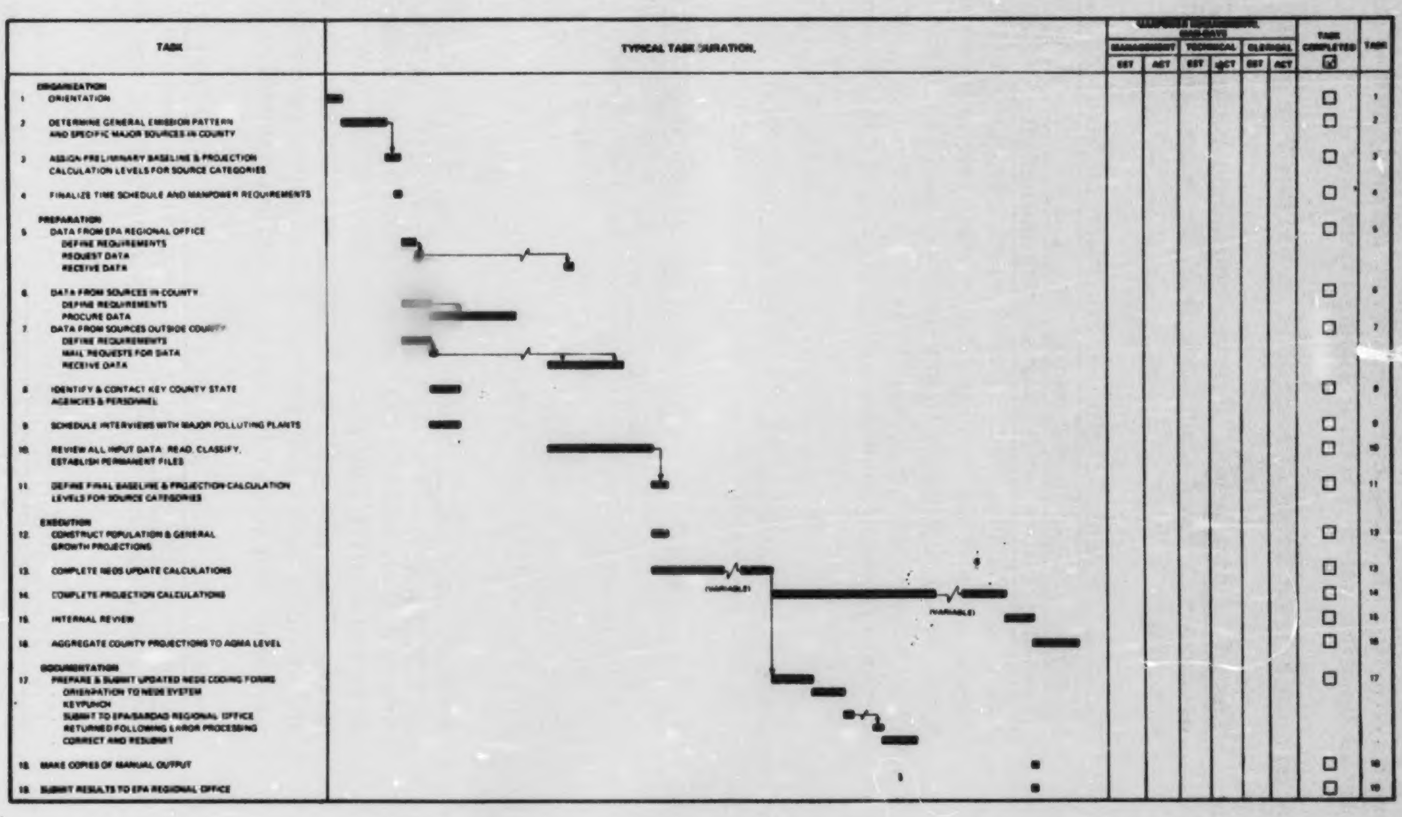
- Number, type and distribution of sources

- Availability of data within the county

- Familiarity of personnel with emission inventory and projection techniques

- Level of accuracy chosen for the calculations.

EXHIBIT 2
Project Organization and Planning



<table>
<tr><th rowspan="3">TASK</th><th rowspan="3">TYPICAL TASK DURATION</th><th colspan="6">MANPOWER REQUIREMENTS (MAN-DAYS)</th><th rowspan="3">TASK COMPLETED
☑</th><th rowspan="3">TASK</th></tr>
<tr><th colspan="2">MANAGEMENT</th><th colspan="2">TECHNICAL</th><th colspan="2">CLERICAL</th></tr>
<tr><th>EST</th><th>ACT</th><th>EST</th><th>ACT</th><th>EST</th><th>ACT</th></tr>
<tr><td>ORGANIZATION</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>1 ORIENTATION</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>1</td></tr>
<tr><td>2 DETERMINE GENERAL EMISSION PATTERN AND SPECIFIC MAJOR SOURCES IN COUNTY</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>2</td></tr>
<tr><td>3 ASSIGN PRELIMINARY BASELINE & PROJECTION CALCULATION LEVELS FOR SOURCE CATEGORIES</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>3</td></tr>
<tr><td>4 FINALIZE TIME SCHEDULE AND MANPOWER REQUIREMENTS</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>4</td></tr>
<tr><td>PREPARATION</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>5 DATA FROM EPA REGIONAL OFFICE
DEFINE REQUIREMENTS
REQUEST DATA
RECEIVE DATA</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>5</td></tr>
<tr><td>6 DATA FROM SOURCES IN COUNTY
DEFINE REQUIREMENTS
PROCURE DATA</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>6</td></tr>
<tr><td>7 DATA FROM SOURCES OUTSIDE COUNTY
DEFINE REQUIREMENTS
MAIL REQUESTS FOR DATA
RECEIVE DATA</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>7</td></tr>
<tr><td>8 IDENTIFY & CONTACT KEY COUNTY STATE AGENCIES & PERSONNEL</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>8</td></tr>
<tr><td>9 SCHEDULE INTERVIEWS WITH MAJOR POLLUTING PLANTS</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>9</td></tr>
<tr><td>10 REVIEW ALL INPUT DATA: READ, CLASSIFY, ESTABLISH PERMANENT FILES</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>10</td></tr>
<tr><td>11 DEFINE FINAL BASELINE & PROJECTION CALCULATION LEVELS FOR SOURCE CATEGORIES</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>11</td></tr>
<tr><td>EXECUTION</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>12 CONSTRUCT POPULATION & GENERAL GROWTH PROJECTIONS</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>12</td></tr>
<tr><td>13 COMPLETE NEDS UPDATE CALCULATIONS</td><td>(VARIABLE)</td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>13</td></tr>
<tr><td>14 COMPLETE PROJECTION CALCULATIONS</td><td>(VARIABLE)</td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>14</td></tr>
<tr><td>15 INTERNAL REVIEW</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>15</td></tr>
<tr><td>16 AGGREGATE COUNTY PROJECTIONS TO AQMA LEVEL</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>16</td></tr>
<tr><td>DOCUMENTATION</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>17 PREPARE & SUBMIT UPDATED NEDS CODING FORMS
ORIENTATION TO NEDS SYSTEM
KEYPUNCH
SUBMIT TO EPA/SAROAD REGIONAL OFFICE
RETURNED FOLLOWING ERROR PROCESSING
CORRECT AND RESUBMIT</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>17</td></tr>
<tr><td>18 MAKE COPIES OF MANUAL OUTPUT</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>18</td></tr>
<tr><td>19 SUBMIT RESULTS TO EPA REGIONAL OFFICE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>☐</td><td>19</td></tr>
</table>

Once the above factors are determined, however, more precise manpower estimates and task duration can be defined; this is one of the initial tasks in establishing a useful management plan.

A complete description of each task in Exhibit 2 is given below:

- Task 1: Orientation: Before proceeding further, it is necessary to read and understand the scope and content of the manual.

- Task 2: Determine general emission patterns and specific major sources in the county, and Task 3: Assign preliminary calculation levels for source categories: These tasks are most critical since the efficient completion of the emissions projections requires that major and minor source types be identified so that resources can be focused on the most important emission sources. (See a previous section in this chapter, General Instructions, for the recommended method.)

- Task 4: Finalize time schedule and manpower requirements: The manpower estimates should be entered in Exhibit 2.

- Tasks 5, 6 and 7: Data from EPA Regional Office and from sources in and outside the county: Required data should be identified and ordered as soon as possible to minimize the effect of the lead time necessary in obtaining some of the data, especially data obtained by mail. Data references are summarized in Chapter II.

- Task 8: Identify and contact key state or county agencies and personnel: The instructions for projecting emissions are based on a local approach to emission computations and it is imperative that the best available local information be used. This requires that a sound working interface be maintained with those people in the county government who are most familiar with the information needed.

- Task 9: Schedule interviews with industry representatives at major polluting plants: All interviews must be arranged and conducted under local or state authority, not under EPA authority.

- Task 10: Review all input data: Most data sources will be used a number of times, so the staff members who will be using them should be familiar with their content. Also, some data sources are complimentary in that they must be used together to provide some input parameter. . This is facilitated by a thorough understanding of their content. A recommended approach for this task is to classify the documents and establish a central file for use by all staff members.

- Task 11: Define final baseline and projection calculation levels for source categories: It may be necessary to adjust the calculation levels assigned in Task 3.

- Task 12: Construct population and general growth projections: These may be developed from the OBERS data if no better projection data are available. Instructions for this task appear at the beginning of Chapter IV.

- Tasks 13 and 14: Complete emission inventory update and projection growth calculations: The work to be performed for these tasks is discussed in Chapters III and IV.

- Task 15: Internal review: The project manager should double check the calculations. Knowledgeable personnel from key state or county agencies may participate in this review.

- Task 16: Aggregate county projections to AQMA level: Note that projections must be made for all counties in the AQMA.

- Task 17: Convert new inventory data to NEDS format: Proposed EPA regulations stipulate that the upgraded baseline inventory (point and area sources) must be converted to NEDS format and submitted as part of the AQM Plan. This involves six steps:

  - Orientation to the NEDS system and coding procedures

  - Code data onto NEDS coding forms

  - Keypunch the coding forms

  - Submit to EPA Regional Office for edit

  - Receive and review the error listings after edit processing by EPA

  - Correct the forms, keypunch and resubmit.

Task 18: Make copies of inventory data for local retention, and Task 19: Submit results to EPA Regional Office: Review by EPA will be aided if an effort is made to fill in all tasks completely and to document data references, calculation methods and assumptions clearly. Exhibit 2 should also be submitted.

9. GLOSSARY OF TERMS

The definition of terms and acronyms used in this manual are given below:

- AP-42: EPA document, Compilation of Air Pollutant Emission Factors, including supplements
- APTD-1135: EPA document, Guide for Compiling a Comprehensive Emission Inventory
- AQCR: Air Quality Control Region
- AQMA: Air Quality Maintenance Area
- CBP: County Business Patterns, U.S. Department of Commerce
- CO: carbon monoxide
- County shares: county portion of an activity level which is defined or measured only at the state level
- DD: heating degree days, available from a number of sources, including Climatic Atlas of the U.S., U.S. Climatological Reports, U.S. Weather Bureau, or Journal of the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- Emission factor: factor relating activity levels to net emissions for area sources, and to uncontrolled emission for point sources
- Equivalent control efficiency: effect of most stringent applicable control regulations, expressed in terms equivalent to control efficiency

- Growth factor: dimensionless ratio of projected activity to baseline activity

- HC: hydrocarbon. (This term ordinarily indicates total hydrocarbons. If only reactive hydrocarbons or non-methane hydrocarbons are of interest, "reactive HC" or "non-methane HC" may be substituted for "HC" in the manual; this fact should be noted on all documentation and completed tables.)

- HC (evap): evaporative hydrocarbon

- HC (exh): exhaust hydrocarbon

- HDD: heavy-duty diesel vehicle

- HDV: heavy-duty gasoline vehicle

- h. u.: housing unit

- LDT: light-duty truck (gasoline)

- LDV: light-duty gasoline vehicle

- Level: three levels of effort are given for the calculations, referring to the level of detail specified and expected accuracy

- MC: motorcycle

- LTO: landing-takeoff cycle

- MIS: Mineral Industry Surveys, U. S. Department of the Interior

- mpg: miles per gallon

- NEDS: National Emissions Data System

- NER: National Emission Report

- NO_x or NOX: nitrogen oxides

- NSPS: Federal New Source Performance Standards
- OBERS Projections: economic projections developed by the U.S. Departments of Commerce and Agriculture
- PART: particulates
- SCC: Eight digit EPA source classification code (e.g., 3-01-001-01, adipic acid production, general cyclohex process)
- SIC: Standard Industrial Classification
- SMSA: standard metropolitan statistical area
- SO_x or SOX: sulfur oxides
- VMT: vehicle-miles travelled

II. DATA SOURCES

The first step to be undertaken before any analysis activities are initiated is to identify and obtain all pertinent sources of data. The quantity and detail of the data required will depend on the level of the forecast to be made.

Three general types of data sources are specified in the emission calculation procedures:

- Data published or supplied by EPA: The following data should be obtained from Air Protection Technical Information Center (APTIC) or from the local EPA Regional Office.
  - EPA documents:
    - Guide for Compiling a Comprehensive Emission Inventory (document APTD-1135). This should be read before starting the calculations because many of the procedures in the manual are described more completely in this document.
    - Compilation of Air Pollutant Emission Factors (document AP-42), including all supplements.
    - NEDS emission factors and source classification codes (SCC) listing.
    - Control Factor/Mobile Source Document This preliminary document provides the latest mobile source emission factors (Oct. 1974) and estimated emission reduction due to promulgated and proposed Federal New Source Performance Standards (NSPS).
    - Projections of Economic Activity for Air Quality Control Regions (OBERS Projections). Background information on this reference is detailed at the end of this Chapter.

- Projections of Economic Activity for Standard Metropolitan Statistical Areas (OBERS Projections: Volume 5). Background information on this reference is detailed at the end of this Chapter.

- Development of Emission Factors for Fugitive Dust Sources (final report for contract number 68-02-0619), work performed by Midwest Research Institute (MRI), June 1974. Report EPA-450/3-74-037.

- Investigation of Fugitive Dust - Sources, Emissions and Control, work performed by PEDCo, May 1973. Final report for contract 68-02-0044, Task 9.

Point and area source data for the county from NEDS in the following formats:

- NEDS point source verification file data for the county (point source printout)

- Stationary source fuel usage report (fuel data)

- Area source report (fuel and transportation activity data)

- Actual/allowable emissions report

- Listing by SCC code of point source emissions and frequency of occurrence (number of points) in the county

- A complete point source printout for the county sorted by pollutant in order of annual emissions.

In case it is desired to repeat the emission projection procedure at some time in the future, care must be taken to use the most current NEDS data as a starting point. The NEDS inventory is updated every six months upon submission by the state of the required semi-annual emission report. The most recent NEDS reports for any county, AQCR or state can be ordered from the National Air Data Branch through the NEDS/SAROAD contact at each EPA regional office. Allow about 4 weeks for tabulation and delivery.

- Data From Local Sources. There are frequently studies and planning documents available at the county level which can be used in preparing the forecasts and which are extremely valuable because they deal directly with the region or county involved. In addition to published documents, direct contact with the appropriate personnel in county agencies or departments should be utilized at every opportunity.

  In general there are four types of studies which, if available, should be located and reviewed before initiating work on the forecasts

  - Transportation studies. These contain projections for routes, traffic, demand, highway construction, and may even predict vehicle emissions. Submission of such studies to the U. S. Department of Transportation is in many cases required by law.

  - Land-use studies. These contain zoning and growth information valuable in estimating local industrial growth, commercial development and population shifts.

  - Air quality or water quality studies. These may reveal new technical data on sources of air pollution within the county.

  - Energy or Fuel-use studies. The energy crisis occasioned a number of studies concerning fuel consumption patterns.

- Additional local data include:

  - Gasoline tax data
  - Proposed sewer system extensions
  - Urban renewal and reconstruction plans
  - Fuel data from dealers and utility companies
  - Refuse and solid waste studies.

Data from sources outside the county. These references contain data accumulated for geographical areas larger than a single county. Typical examples are:

- Mineral Industry Surveys:
  - "Sales of Fuel Oil and Kerosene"
  - "Natural Gas Production and Consumption"
  - "Sales of LPG and Ethane"
  - "Coal - Bituminous and Lignite"

  from U.S. Department of the Interior, Bureau of Mines, Washington, D. C.

- Minerals Yearbook, U.S. Department of the Interior, Bureau of Mines, Washington, D. C.

- County Business Patterns, U.S. Department of Commerce, Bureau of the Census, Washington, D. C. The relationship between the CBP sectors and NER process categories is denoted at the end of Chapter II.

- 1972 Census of Manufacturers, including Special Report on Fuels and Electric Energy Consumed, U.S. Department of Commerce, Bureau of the Census, Washington, D. C.

- 1972 Census of Transportation, U.S. Department of Commerce, Bureau of the Census, Washington, D. C.

- 1970 Census of Housing, U.S. Department of Commerce, Bureau of the Census, Washington, D. C.

- Federal Power Commission Form 67. Obtain from FPC Regional Offices.

- Steam Electric Plant Factors, National Coal Association, Washington, D. C. (or equivalent data from the Federal Power Commission).

- Highway Statistics, U.S. Department of Transportation, Federal Highway Administration, Washington, D. C.

- Waterborne Commerce of the United States, U.S. Department of the Army, Corps of Engineers, New Orleans, Louisiana.
- Depreciation Guidelines and Rules, U.S. Department of the Treasury, Internal Revenue Service, Pub. No. 456, Washington, D. C., August 1964.
- FAA Air Traffic Activity, U.S. Department of Transportation, Federal Aviation Administration, Washington, D.C.
- Military Air Traffic Activity Report, U.S. Department of Transportation, Federal Aviation Administration, Washington, D.C.

The edition of any data source used should, of course, be the most recent available. The sources to be obtained should be identified and ordered at the beginning of the forecast effort.

* * * * *

The OBERS projections for AQCRs and SMSAs are available from the EPA Regional Office and serve as general growth indicators or as default growth factors if no better projection data are available. The choice of which OBERS projection (AQCR or SMSA) to use should be based on which region (AQCR or SMSA) corresponds more closely to the AQMA in question.

The OBERS projections, cited on page II-1 and referenced many times in the projection procedures, were developed by the Office of Business Economics (OBE), presently the Bureau of Economic Analysis of the U.S. Department of Commerce, and the Economic Research Service (ERS) of the U.S. Department of Agriculture. The effort was sponsored by the United States Water Resources Council. The program was initiated in 1964. Projections of population, employment and earnings have been developed by state, water resources area, 173 OBE economic areas, and AQCR and SMSA. Employment and earnings projections are available for 37 industrial groups, mostly consisting of two digit level SIC detail. Documentation of the projection methodology and preliminary projections of economic activity have been previously published by the United States Water Resources Council (U.S. Department of Commerce and U.S. Department of Agriculture, 1971). The projections are basically developed by a computer model which projects the share of employment and earnings by industry sector in each of the 173 OBE economic areas.

In some cases OBERS data for a particular industrial sector are incomplete or have been deleted entirely to avoid disclosure of confidential information. In these cases, other sources of projection data must be consulted. Often these deletions are necessary to avoid disclosure of data pertaining to an individual establishment. If these establishments can be identified and contacted, they may provide the data required to make the growth projections.

The relationship between NER process categories and the corresponding OBERS industrial sectors is as follows:

NER Process Categories	OBERS Categories
Chemical Manufacture	Chemicals and Allied Products
Food/Agriculture	Food and Kindred Products
Primary Metals	Primary Metals
Secondary Metals	Primary Metals
Mineral Products	Other Manufacturing
Petroleum Industry	Petroleum Refining
Wood Products	(Lumber Products and Furniture) (Paper and Allied Products)
Evaporation	Total Manufacturing
Metal Fabrication	Fabricated Metals and Ordnance
Leather Products	Other Manufacturing
Textile Manufacture	Textile Mill Products
Inprocess Fuel	Total Manufacturing
Other	Other Manufacturing

The relationship between NER process categories and the corresponding County Business Patterns sectors is as follows:

NER Process Categories	County Business Patterns Categories
Chemical Manufacture	(Chemical and Allied Products) (Rubber and Plastics Products)
Food/Agriculture	Food and Kindred Products

Primary Metals	Primary Metals
Secondary Metals	Primary Metals
Mineral Products	Stone, Clay and Glass Products
Petroleum Industry	Petroleum and Coal Products
Wood Products	(Lumber and Wood Products) + (Furniture and Fixtures) + (Paper and Allied Products)
Evaporation	Total Manufacturing

NER Process Categories	County Business Patterns Categories
Metal Fabrication	Fabricated Metal Products
Leather Products	Leather and Leather Products
Textile Manufacture	Textile Mill Products
Inprocess Fuel	Total Manufacturing
Other	Other Manufacturing

III. EMISSION INVENTORY UPGRADING AND UPDATING PROCEDURES

Chapters I and II of the manual should be read before beginning the inventory update procedures. Chapter I, under Project Organization and Planning, contains the recommended procedure for organizing and completing the work specified in this chapter (inventory update) and in the following chapter (emission projections). It also contains a detailed description of: the specific organization, preparation and documentation of tasks which must be completed, and the interrelationship and time sequence of those tasks. Following completion of all preliminary tasks, the update procedures should commence with a review of three of the NEDS computer printouts:

- Total emissions for each of the five criteria pollutants in NER format
- Rank order listing of point source emissions data sequenced so that the largest emitters are reported first
- Area source data.

The data are for the most recent NEDS inventory year and represent the most accurate information available to the EPA. Local emission inventories can initially be used instead of NEDS data to establish the baseline inventory. It must be emphasized, however, that such data must be converted to NEDS format prior to submission of the Air Quality Maintenance Plan (AQMP).

The first step is to review these data to determine if there are any obvious errors or omissions of large point sources. The point sources accounting for approximately 90 and 95 percent of the total pollution, in aggregate, should be identified and marked on the point source listing in an appropriate way.

If the county emissions data contain deficiencies or are out of date, the inventory should be updated using the instructions that follow. In any event, it will always be worthwhile to carry out a Level 1 update. More comprehensive inventory updates can be completed by following the Level 2 or Level 3 instructions.

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All individual point source data collected in completing the inventory update should be retained especially if any air quality modeling of the region is to be performed. Such data includes geographic location, stack information and daily and seasonal variation in emissions.

The recommended source documents for emission factors are AP-42 and the NEDS emission factor file. For area sources AP-42 must be used since the NEDS file contains no area source factors. For point sources either can be used, but the NEDS file is preferable because it is used by the NEDS emission inventory system.

The following explanations refer to the terminology used in Chapters III and IV.

- Three "levels" of effort are given for the calculations. These were defined in Chapter I, and refer to increasingly more detailed and time-consuming procedures. Alternate "methods" are occasionally specified for a given level. These are roughly equivalent in accuracy and complexity; the choice of which one to use is determined largely by the availability of data.
- County share means the county portion of an activity level (e.g., fuel consumption) which is defined or available only for a larger geographical area.
- A growth factor, also defined in Chapter I, refers to a dimensionless ratio of projected activity to base year activity.

A glossary of all other terms and acronyms used can be found at the end of Chapter I.

The classification scheme recommended for categorizing industrial process emissions is the SCC code because most emission control regulations and emission factors are specified on that basis. While the NEDS emission inventory is also classified in that way, other local emission inventories may be based on an industrial classification such as SIC codes. In that case, a mapping or correlation between the classification systems must be developed.

The procedures are described in the following sections for the three levels of effort:

(1) Industrial Process

(2) Fuel Combustion

(3) Transportation

(4) Electric Generation

(5) Incineration

(6) Miscellaneous.

LEVEL 1 EMISSION INVENTORY UPDATE

The procedures used in this level require only a minimum of data beyond that available from the EPA Regional Office. Specifically it will be necessary to obtain data on:

- Current county population
- Employment (County Business Patterns)
- Fuels used in the county in the base year.

The first step should be to obtain these data.

(1) Industrial Process Emissions

The Level 3 emission inventory update is recommended for industrial process emissions because:

- Net emissions from industrial processes are highly dependent on the extent of emission control for individual point sources; aggregated source categories only are considered in Level 1
- Many polluting industries are not labor intensive; emissions are assumed proportional to employment in Level 1.

1. Fill in columns 1-5 of Table 1.1* from the county NER received from EPA.

2. For each non-zero emission category, compute an adjustment factor (f) using sector employment data from County Business Patterns:

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* All tables and figures are included in the Appendix.

f = (sector employment in baseline year)/
(sector employment in NEDS year.)

(County Business Patterns contains data in approximately the same process detail as NER process categories; see comparison on page II-6.) The factor f is computed to update the NEDS data to the baseline year, since NEDS may have become outdated. Enter f in column 6, Table 1.1.

3. Scale NER emissions (col. 1-5) by f to produce current emissions and enter in columns 7-11, Table 1.1 and in Table 7.1.

(2) Fuel Combustion Emissions

1. From state energy studies or fuel statistics, determine state totals for use of each fuel by each customer category (residential, industrial, commercial/institutional); consult state fuel study or statistics.

2. If these data are not available, produce state sales totals by customer category from the Mineral Industry Survey (MIS) and Bureau of Mines data; make sure fuel units used in these calculations are consistent (e.g., 1000 gallons of oil, not barrels). Procedures for deriving this information for different fuels from MIS or Bureau of Mines data are as follows:

(1) Oil

(Note: Table 2.4 is used to allocate MIS oil data to customer category and is not to be used for other fuels.)

Oil data in MIS is given in units of 1000 barrels. Convert these units to gallons (42 gallons per barrel); use units of 1000 gallons in Table 2.4. For your state, enter in Table 2.4 (column 1 for residual oil, column 2 for distillate oil) the following data:

  - Total residual heating oil sales (MIS Table 7),* and total distillate heating oil sales, including kerosene (MIS Tables 5 and 6), enter on line 1

  - Sales for military use (MIS Table 12), on line 6

  - Sales for industrial use (MIS Table 8), enter on line 7

  - Sales for oil company use (MIS Table 9), enter in line 8

- Compute commercial/institutional employment percentage of total commercial and industrial employment (from County Business Patterns) and enter on line 2. (Commercial/institutional activity is equivalent to SIC 50-99).

- Compute industrial employment percentage of total commercial and industrial employment and enter on line 3; (industrial activity is equivalent to SIC 20-39). (The sum of the industrial and commercial/institutional percentages must equal 1.00.)

- Determine housing units using oil for heat from Census of Housing, and compute residential distillate use (in units of 1000 gallons) as: (h. u. using oil for heat) x (0.18 gal/D. D. /h. u.) x (D. D.) + (h. u. using oil for hot water x 250 gal x .001) and enter on line 9, column 2. Enter the amount of residual oil, if any, used for residences on line 9, column 1, if this can be determined. Otherwise enter zero. Note: D. D. = heating degree days, h. u. = housing units. Use degree day data tabulated for nearest reporting station.

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* The Table references given are for the 1970 edition of MIS.

- Multiply line 2 factor by (line 1 minus line 9) and enter on line 4; multiply line 3 factor by (line 1 minus line 9) and enter on line 5. This produces shares of heating oil for commercial/institutional and industrial use.

- Total commercial/institutional use is the sum of lines 4 and 6; enter on line 10.

- Total industrial use is the sum of lines 5, 7 and 8; enter on line 11.

(2) Coal

Consult MIS, and in addition use NEDS and state fuel statistics for coal use data. In using MIS, assume that totals for "retail dealers" include all residential and commercial/institutional coal use and that industrial coal use is equivalent to the totals for "all others." Determine housing units using coal for heat from Census of Housing. Residential coal use may be computed as follows:

$$\text{coal use (tons)} = (\text{h. u. using coal for heat}) \times (0.0012\ \text{ton/D. D. /h. u.}) \times (\text{D. D.})$$

To determine coal type (anthracite, bituminous, lignite), see MIS and contact coal dealers.

(3) Natural Gas

Consult MIS, which contains data for the required customer categories (residential, industrial, commercial/institutional).

(4) Minor Fuels

Determine from county NER which fuels are burned in significant quantities, then use NEDS, MIS, and state or county fuel statistics to obtain customer information.

3. The use of electricity, while producing no emissions at the point of consumption, must be considered when determining the base year Btu demand. Only the electricity used as a substitute for fuel combustion should be considered, however. This type of consumption includes primarily space heating and cooling, and does not include the use of electric appliances or industrial machinery. Determine the amount of electricity used for space heat in the state (or in the county, if those data are available) by each customer category (residential, industrial, commercial/institutional). The best source of this data is the Regional Electric Reliability Council.

4. Industrial and commercial/institutional state fuel use must be disaggregated into point and area sources. Point source natural gas and distillate oil use must be further disaggregated into internal and external combustion. (Fuel use for all other fuels is for external combustion.) Compute the ratio of area source emissions to total emissions, and point source emissions to total emissions, for each fuel for industrial and commercial/institutional users from data available from state or local air quality agencies. Use these ratios to allocate the total county fuel use computed previously to point and area sources. (Allocation to point and area sources is not as important as determining accurate fuel use totals.) Consult any available state or county fuel use data to separate natural gas and distillate oil use into internal and external combustion.

5. Use the results of steps 1 to 4 above to fill in Table 2.5 with state sales totals for all fuels and customer categories.

6. Determine the county share of the state totals in Table 2.5 for each fuel type and enter in Table 2.1.

- Apportion residential use by county share of the total state dwelling units using each type of fuel.

- Apportion commercial/institutional use by county share of population.

- Apportion industrial use by county share of manufacturing employees, adjusted by fuel intensity use factors for each two-digit SIC group. The fuel intensity use factors may be calculated from data given in the current Census of Manufactures, Special Report on Fuel and Electric Energy Consumed. The data given for dollar value of fuel sold may be divided by manufacturing employment to produce fuel intensity factors for each two-digit SIC group. In the absence of these data the following nationwide averages may be used to estimate fuel intensity ratios for SIC groups:

Industrial Category *	Fuel Intensity Ratio
Food & kindred products	0.27
Textile mill products	0.13
Apparel & other fabric products	0.03
Lumber products and furniture	0.27
Paper and allied products	0.69
Printing and publishing	0.04
Chemicals and allied products	0.88
Petroleum refining	2.83
Primary metals	0.87
Fabricated metals	0.13
Machinery excluding electrical	0.08
Electrical machinery and supplies	0.06
Transportation equipment	0.09
Other manufacturing	0.06

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* From County Business Patterns.

The county share for apportioning industrial fuel use is computed as follows. If e_i is the county employment in sector i (e.g., Food and Kindred Products), E_i is the state employment in the same sector, and f_i the corresponding Fuel Intensity Ratio (0.27 for that sector), the county share for any fuel is given by

$$\frac{\Sigma e_i f_i}{\Sigma E_i f_i}$$

where $\Sigma e_i f_i = e_1 f_1 + e_2 f_2 + e_3 f_3 + \ldots .$

and $\Sigma E_i f_i = E_1 f_1 + E_2 f_2 + E_3 f_3 + \ldots .$

7. Determine county gasoline and diesel use for stationary internal combustion for both industrial and commercial/institutional users from contact with fuel dealers or from available county fuel use data or studies. Enter in Table 2.1.

8. Determine sulfur and ash content for coal and sulfur content for oil consumed in the county. Consult the same sources that were used previously:

- State fuel studies
- Bureau of Mines and MIS data
- NEDS data.

A weighted average for sulfur and ash content should be used for a fuel if not all the fuel has the same content. (For example, distillate oil with different sulfur contents may be supplied through different companies.) This weighted average factor is formed by weighting the quantity of fuel consumed by the sulfur or ash content of that quantity. Enter the sulfur and ash content data in Table 2.3.

9. Convert the county fuel use data in Table 2.1 to emissions by multiplying by:

- The emission factor from AP-42 or the NEDS emission factor file. Emissions from fuel combustion depend on the type and size of the boiler. If most of the boilers are the same type and size, the appropriate emission factor can be determined easily. If this is not the case, form weighted emission factors reflecting the mix of boiler type and size, based on data from distributors, servicemen or state registrations.

- The sulfur or ash content, if applicable
- For point sources, the equivalent control efficiency required by future emission regulations, including NSPS.

Enter emissions in Table 7. 1.

(3) Transportation

1. Highway Vehicles

Procedures used to estimate emissions from highway vehicles have in the past considered three major vehicle classifications:

- Light-duty gasoline
- Heavy-duty gasoline
- Heavy-duty diesel.

These correspond identically to the vehicle categories given in the NER. Emission factors for these categories are given in AP-42. Highway vehicle categories have recently been expanded by EPA to include the following:

- Light-duty vehicles (LDV)
- Light-duty trucks (LDT)
- Heavy-duty gasoline vehicles (HDV)
- Heavy-duty diesel vehicles (HDD)
- Motorcycles (MC).

combustion depend on the type and size of the boiler. If most of the boilers are the same type and size, the appropriate emission factor can be determined easily. If this is not the case, form weighted emission factors reflecting the mix of boiler type and size, based on data from distributors, servicemen or state registrations.

- The sulfur or ash content, if applicable
- For point sources, the equivalent control efficiency required by future emission regulations, including NSPS.

Enter emissions in Table 7.1.

(3) Transportation

1. Highway Vehicles

Procedures used to estimate emissions from highway vehicles have in the past considered three major vehicle classifications:

- Light-duty gasoline
- Heavy-duty gasoline
- Heavy-duty diesel.

These correspond identically to the vehicle categories given in the NER. Emission factors for these categories are given in AP-42. Highway vehicle categories have recently been expanded by EPA to include the following:

- Light-duty vehicles (LDV)
- Light-duty trucks (LDT)
- Heavy-duty gasoline vehicles (HDV)
- Heavy-duty diesel vehicles (HDD)
- Motorcycles (MC).

Emission factors for these categories from 1973 to 1985 are given in the Control Factor/Mobile Source document referenced in Chapter II. Ideally the five vehicle classification should be used to compute base year emissions because of the improved accuracy. However, the data required to apportion total gasoline sales to the various gasoline vehicles, and average miles per gallon for those vehicles, are still under development by EPA. Consequently, calculations involving only the three vehicle classification are required for Level 1.

(1) Determine total county gasoline and diesel use for highway vehicles from county fuel sales statistics. This method assumes that all fuel consumed in the county is sold in the county. If only state totals are available, compute the county share based on vehicle registration or population. Use the county share factor which seems most appropriate in terms of vehicle use patterns in the county.

(2) If the county statistics include vehicle miles traveled (VMT) for gasoline and diesel vehicles, enter these data directly in Table 3.4. If not, from county gasoline sales compute VMT for all light-duty gasoline vehicles (includes LDV, LDT and MC) from total gas sales as: (total gas sales) x (89 percent for light-duty gasoline vehicles) x (13.6 mpg) and enter in column 1, Table 3.4. Leave columns 2-3 of Table 3.4 blank. Also leave line for growth factors blank.

(3) Compute VMT for heavy-duty gasoline vehicles (HDV) from total gas sales as: (total gas sales) x (11 percent for HDV) x (8.4 mpg) and enter in column 4, Table 3.4.

(4) Compute VMT for heavy-duty diesel (HDD) from diesel sales as (total diesel sales) x (5.1 mpg) and enter in column 5, Table 3.4.

(5) To simplify this Level 1 inventory update, estimate the speed correction factor for light-duty vehicles according to the general type of roads prevalent in the county. If the county is predominantly urban, use correction factors of:

- 0.8 for HC (exh) and CO
- 1.1 for NO_x.

If the county is predominantly rural, use correction factors of:

- 0.6 for HC (exh) and CO
- 1.3 for NO_x.

Enter the speed correction factors in Table 3.4.

(6) The age distribution of county light-duty gasoline vehicles and the annual mileage driven by the vehicles of each age group must be considered to produce weighted emission factors for HC (exh), CO and NO_x. For light-duty gasoline vehicles, the equation for the weighted emission factor e_{np} for calendar year (n) and pollutant (p) is

$$e_{np} = \frac{\sum_i (c_i \times d_i \times f_i \times t_i)}{\sum_i f_i t_i}$$

where

i = age of vehicle

c_i = the federal test emission factor for the model year corresponding to vehicle age (i) at low mileage

d_i = the controlled pollutant (p) emission deterioration factor for model year (i) at calendar year n

f_i = fraction of total vehicles in use of age (i)

t_i = average annual miles driven by vehicles of age (i)

Note that this equation is equivalent to the one given in AP-42 but is expressed in a slightly different form because in the above equation

- The speed adjustment is assumed independent of vehicle age
- The expanded form of the weighted annual travel term (m_i in AP-42) is given.

A detailed discussion of this method, as well as test emission factors and nationwide data which can be used for f_i and t_i (if no local data are available) can be found in AP-42. Calculation of weighted emission factors using the above equation may be facilitated by using Table 3.2 as a step by step work sheet. Instructions for completing Table 3.2 are given starting on page 84.

Enter these weighted emission factors in Table 3.4. Enter emission factors for HC (evap), SO_x and particulates from the same source in Table 3.4.

If emissions in the county from heavy-duty gasoline vehicles are sufficient to justify including the effects of speed correction, vehicle age and model year distribution, proceed in the manner used for light-duty vehicles and enter the data in Table 3.4.

(7) To compute baseline emissions, multiply the baseline VMT by the speed correction factors (for HC (exh), CO, and NO_x only), and by the highway vehicle emission factors from the Control Factor/Mobile Source document (for light-duty gasoline vehicles use the weighted emission factors computed above). Add HC (exh) and HC (evap) emissions to produce total HC emissions, and enter baseline emissions in Table 7.1.

2. Off-Highway Vehicles

(1) Gasoline Vehicles

- Determine off-highway gasoline use from county fuel use data. Enter on lines 1-2, Table 3.1.

- If these data are not available, calculate farm tractor gasoline use by multiplying the number of gasoline tractors in use in the county by the consumption rate of 1000 gallons/tractor/year. If the number of gasoline tractors cannot be determined, assume 60 percent of all tractors use gasoline. Calculate all other off-highway gasoline use by multiplying county population by an average factor of 13 gallons/capita/year. Enter on lines 1-2, Table 3.1.

- Compute base year emissions by multiplying the fuel use for each category by the emission factors from AP-42, add to produce total off-highway gasoline emissions, and enter in Table 7.1.

(2) Diesel Vehicles

- Determine off-highway diesel use from county fuel use data. Enter on lines 3-5, Table 3.1.

- If these data are not available, calculate farm tractor diesel use by multiplying the number of diesel tractors in use in the county by the consumption rate of 1000 gallons/tractor/year. If the number of diesel tractors cannot be determined, assume 35 percent of all tractors use diesel fuel (liquid petroleum gas accounts for the remaining 5 percent).

To calculate diesel use by construction equipment, multiply non-building construction employment (from County Business Patterns) by an average factor of 5000 gallons/employee. Calculate all other off-highway diesel use by multiplying county population by an average factor of 7.4 gallons/capita/year. Enter on lines 3-5, Table 3.1.

If this estimation method must be used (because county fuel use data are not available), the results should be checked by estimating state totals using the same method and comparing on a state basis with literature data. Off highway gasoline sales are reported in Highway Statistics and off highway diesel sales in MIS.

Compute base year emissions by multiplying the fuel use for each category by the emission factors from AP-42, add to produce total off-highway gasoline emissions, and enter in Table 7.1.

3. Rail

Determine the county diesel fuel use for rail operations from available data in transportation studies or directly from the railroads. If these data are not available, use state fuel consumption data from the MIS, and compute county share by scaling with miles of track in the county divided by miles of track in the state or approximate by county population share. Enter on line 6, Table 3.1.

4. Vessels

(1) Oil

Determine county fuel use from interviews with shippers or port authority. If this cannot be done, calculate dockside and underway components based on vessel movement data from Waterborne Commerce of the U.S.

- **Dockside**. Determine the average time in port from port authority or shippers (or use 3 days), then apportion oil use as follows: 1900 gallons/day for residual, 660 gallons/day for diesel.
- **Underway**. Usually diesel only. Determine total vessel diesel oil use from interviews or published data; then subtract dockside use, and apportion remainder to ports by tonnage. If these data are not available, county vessel miles must be computed, and fuel use estimated by using 19 gallons/nautical mile for diesel, and 44 gallons/nautical mile for residual. See APTD-1135 for a complete discussion of this method.

(2) Coal

Determine county fuel use from interviews with shippers or port authority, or get state fuel use from Waterborne Commerce of the U.S.; calculate county share by computing the tonnage ratio and scaling state data.

(3) Gasoline

Determine fuel use from county data or from studies on leisure or recreation. If not available, interview gasoline dealers to obtain sales figures at recreation sites, or use 160 gallons/year/vessel and scale by boat registrations.

Enter fuel use by vessels (oil, coal, gasoline) as determined above on lines 7-10, Table 3.1. Compute base year emissions by multiplying fuel use by the emission factors from AP-42, and enter in Table 7.1.

5. Aircraft

The activity from which aircraft emissions are computed is landing and takeoff cycles (LTO). To determine baseline emissions from aircraft, use county LTO data by aircraft type; consult airports individually or county air transportation plans or studies. If these data are not available, determine state air traffic activity from FAA statistics and disaggregate to the county level based on county share of passengers and freight. Military activity should be included. Enter in column 1, Table 3.5. Compute base year emissions by multiplying base year LTO cycles for each aircraft type by the emission factors from AP-42, and enter in Table 7.1.

(4) Electric Generation Emissions

Determine which fuels are burned in the county to generate electricity (both internal and external combustion), the quantity of those fuels, and sulfur and ash content, if applicable, from:

- County or state utility commission data
- Regional Electric Reliability Council data
- Federal Power Commission Form 67.

Enter in columns 1-5, Table 4.1. A number of blank lines are provided in Table 5.1 to allow for a number of different fuels which may be used in the county; all lines may not be needed.

Convert the future fuel use data to emissions by multiplying by:

- The emission factor from AP-42 or the NEDS emission factor file. Emissions from electricity generation depend on the type and size of the boiler. If most of the boilers are the same type and size, the appropriate emission factor can be determined easily. If this is not the case, form weighted emission factors reflecting the mix of boiler type and size, based on data from the references given above.

- The sulfur or ash content, if applicable.

- For point sources, the equivalent control efficiency required by future emission regulations, including NSPS.

Enter emissions in Table 7.1.

(5) Incineration

Compute base year incineration and open burning levels from the nationwide average factors below unless it is known that existing regulations on open burning contradict these average factors. Tonnage refers to tons of solid waste actually burned, not total collected:

- Residential open burning: 122 tons/1000 population/yr
- Residential on-site incineration: 40 tons/1000 population/yr
- Commercial/institutional open burning: 12 tons/1000 population/yr
- Commercial/institutional on-site incineration: 50 tons/1000 population/yr
- Industrial open burning: 160 tons/1000 mfg. employees/yr
- Industrial on-site incineration: 335 tons/1000 mfg. employees/yr.

County manufacturing employment data referenced above can be taken from county employment data or from County Business Patterns.

Total industrial and commercial/institutional incineration levels must be disaggregated into point and area sources. To do this, compute point and area percentage ratios from the county NER for each pollutant as:

$$\frac{\text{(point source incineration emissions)}}{\text{(total incineration emissions)}}$$

and

$$\frac{\text{(area source incineration emissions)}}{\text{(total incineration emissions)}}$$

Enter the incineration levels in Table 5.1, and scale baseline activity by the appropriate emission factors from AP-42 and enter in Table 7.1.

(6) Miscellaneous Area Sources

1. Evaporation

(1) Gasoline

Determine the total gasoline retail sales in the county, either through interviews with dealers or from the county or state tax agency. Enter the results in column 1, Table 6.1. Convert to base year emissions by multiplying by the emission factors from AP-42; enter in Table 7.1 on the line "gas handling evaporation loss" in the transportation (area) emissions category.

(2) Solvents

Estimate the amount of solvents used in the county from the baseline population and one of the following national average use factors:

- County population less than 100,000:
  - 3 lb/capita/yr
- County population 100,000 to 500,000:
  - 8 lb/capita/yr
- County population 500,000 to 1,000,000:
  - 18 lb/capita/yr
- County population greater than 1,000,000:
  - 28 lb/capita/yr.

The factors above refer to the total area source solvent use in the county, including dry cleaning, surface coating and industrial area sources. Enter this amount in Table 6.1. Convert to baseline emissions by multiplying by the appropriate emission factor from AP-42, and enter in Table 7.1, as the total for the solvent evaporation category, under miscellaneous area sources.

2. Other Miscellaneous Sources

Calculation of baseline and projected emissions for these miscellaneous sources is not included specifically in Chapters III and IV because procedures for estimating emissions from these sources which were not regarded as significant in the past are in the process of being modified and improved. The miscellaneous area source categories in Tables 7.1 and 7.2 have been expanded from the categories in the NEDS NER format, and reflect the increasing importance associated with these sources. Space for recording the calculations of miscellaneous emissions is provided in Table 6.2.

LEVEL 2 EMISSION INVENTORY UPDATE

In addition to the Level 1 data, it will be necessary to obtain local planning data and air emissions data, as well as national data on industrial activities. Specific data sources to be consulted include:

- County industrial studies
- County land-use plans
- Current county emissions inventory
- Census of Manufactures, Special Report on Fuel and Electric Energy Consumed
- Mineral Industry Surveys
- County Business Patterns
- Fuel Dealer Sales Data
- Vehicle miles traveled by vehicle type.

The first step should be to obtain the data.

(1) Process Emissions

The Level 3 emission inventory update is recommended for industrial process emissions because net emissions from industrial processes are highly dependent on the extent of emission control for individual point sources; aggregated source categories only are considered in Level 2.

Use Method 1 if possible; otherwise use Method 2 or 3.

1. Method 1

Review current county or state emissions data taken from local emissions inventory. Arrange raw data by SCC as given in NEDS source classification code listing. Aggregate this point source data to the NER sector level, and fill in Table 7.1 with current emissions. If sufficient emissions data are not available to do this, use Method 2.

2. Method 2

(1) Fill in columns 1-5 of Table 1.1 from the county NER.

(2) Compute the adjustment factor f using current county employment data from the sources cited previously. This adjustment factor is used to update the process emissions reported in the county NER to baseline year levels.

(3) Scale columns 1-5 by 5 and enter in columns 7-11 in Table 1.1, and in Table 7.1.

3. Method 3

Proceed as in Method 2 above, but use Table 1.3 instead of Table 1.1, and consider individual SCC processes rather than aggregated process categories. Note that the use of Table 1.3 allows f factors for individual processes to be used if available.

(2) Fuel Combustion Emissions

1. Determine state totals from state energy studies or fuel statistics for use of each fuel by each customer category (residential, industrial, commercial/institutional); consult state fuel study or statistics.

2. If these data are not available, produce state sales totals by customer category from the Mineral Industry Survey (MIS) and Bureau of Mines data: make sure fuel units used in these calculations are consistent (e.g., 1000 gallons of oil, not barrels). Procedures for computing this information for different fuels from MIS or Bureau of Mines data are as follows:

(1) **Oil**

(Note: Table 2.4 is used to allocate MIS oil data to customer category and is not to be used for other fuels.)

- For your state, enter in Table 2.4 (column 1 for residual oil, column 2 for distillate oil) the following data:
    - Total residual heating oil sales (MIS Table 7)*, total distillate heating oil sales, including kerosene (MIS Tables 5 and 6) and enter on line 1
    - Sales for military use (MIS Table 12), on line 6
    - Sales for industrial use (MIS Table 8), enter on line 7
    - Sales for oil company use (MIS Table 9), enter on line 8
- Compute commercial/institutional employment percentage of total commercial and industrial employment (from County Business Patterns) and enter on line 2
- Compute industrial employment percentage of total commercial and industrial employment and enter on line 3 (The sum of the industrial and commercial/institutional percentage must equal 1.0.)
- Determine housing units using oil for heat from Census of Housing, and compute residential distillate use (in units of 1000 gallons) as:

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* The Table references given are for the 1970 edition of MIS.

(h.u. using oil for heat) x (0.18 gal/ D.D. h.u.) x (D.D.) + (h.u. using oil for hot water x 250 gal x .001)

and enter on line 9, column 2. Enter the amount of residual oil, if any, used for residences on line 9, column 1, if this can be determined. Otherwise enter zero. Note: D.D. = heating degree days, h.u. = housing units. Use degree day data tabulated for nearest reporting station.

- Multiply line 2 factor by (line 1 minus line 9) and enter on line 4; multiply line 3 factor by (line 1 minus line 9) and enter on line 5. This produces shares of heating oil for commercial/institutional and industrial use
- Total commercial/institutional use is the sum of lines 4 and 6; enter on line 10
- Total industrial use is the sum of lines 5, 7 and 8; enter on line 11.

(2) Coal

Consult MIS, and in addition use NEDS and state fuel statistics for coal use data. In using MIS, assume that totals for "retail dealers" include all residential and commercial/institutional coal use and that industrial coal use is equivalent to the totals for "all others." Determine housing units using coal for heat from Census of Housing. Residential coal use may be computed as follows:

coal use (tons) = (h.u. using coal for heat) (0.0012 ton/D.D./h.u.) x (D.D.)

To determine coal type (anthracite, bituminous, lignite), see MIS and contact coal dealers.

(3) Natural Gas

Consult MIS, which contains data for the required customer categories (residential, industrial, commercial/institutional).

(4) Minor Fuels

Determine from county NER which fuels are burned in significant quantities, then use NEDS, MIS, and state or county fuel statistics to obtain customer information.

3. The use of electricity, while producing no emissions at the point of consumption, must be considered when determining the base year Btu demand. Only the electricity used as a substitute for fuel combustion should be considered, however. This type of consumption includes primarily space heating and cooling, and does not include the use of electrical appliances or industrial machinery. Determine the amount of electricity used for space heat in the state (or in the county, if that data are available) by each customer category (residential, industrial, commercial/institutional). The best source of this data is the Regional Electric Reliability Council.

4. Industrial and commercial/institutional state fuel use must be disaggregated into point and area sources. Point source natural gas and distillate oil use must be further disaggregated into internal and external combustion. (Fuel use for all other fuels is for external combustion.) Compute the ratio of area source emissions to total emissions and point source emissions to total emissions for each fuel for industrial and commercial/institutional users from data available from state or local air quality agencies. Use these ratios to allocate the total county fuel use computed previously to point and area sources. (Allocation to point and area sources is not as important as determining accurate fuel use totals). Consult any available state or county fuel use data to separate natural gas and distillate oil use into internal and external combustion.

5. Use the results of Steps 1 to 4 above to fill in Table 2.5 with state sales totals for all fuels and customer categories.

6. Determine the county share of the state totals in Table 2.5 for each fuel type and enter in Table 2.1.

- Apportion residential use by county share of the total state dwelling units using each type of fuel

- Apportion commercial/institutional use by county share of population

- Apportion industrial use by county share of manufacturing employees, adjusted by fuel intensity use factors for each two-digit SIC group. The fuel intensity use factors may be calculated from data given in the current Census of Manufactures, Special Report on Fuel and Electric Energy Consumed. The data given for dollar value of fuel sold may be divided by manufacturing employment to produce fuel intensity factors for each two-digit SIC group. In the absence of this data the following nationwide averages may be used to estimate fuel intensity ratios for SIC groups:

Industrial Category*	Fuel Intensity Ratio
Food & kindred products	0.27
Textile mill products	0.13
Apparel & other fabric products	0.03
Lumber products and furniture	0.27
Paper and allied products	0.69
Printing and publishing	0.04
Chemicals and allied products	0.88
Petroleum refining	2.89
Primary metals	0.87
Fabricated metals	0.13
Machinery excluding electrical	0.08
Electrical machinery and supplies	0.06
Transportation equipment	0.09
Other manufacturing	0.06

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* From County Business Patterns.

The county share for apportioning industrial fuel use is computed as follows. If e_i is the county employment in sector i (e.g., Food and Kindred Products), E_i is the state employment in the same sector, and f_i the corresponding Fuel Intensity Ratio (0.27 for that sector), the county share is given by

$$\frac{\Sigma e_i f_i}{\Sigma E_i f_i}$$

where $\Sigma e_i f_i = e_1 f_1 + e_2 f_2 + e_3 f_3 + \ldots$

and $\Sigma E_i f_i = E_1 f_1 + E_2 f_2 + E_3 f_3 + \ldots$

7. Determine county gasoline and diesel use for stationary internal combustion for both industrial and commercial/institutional users from contact with fuel dealers or from available county fuel use data or studies. Enter in Table 2.1.

8. Determine sulfur and ash content for coal and sulfur content for oil consumed in the county. Consult the same sources that were used previously:

- State fuel studies
- Bureau of Mines and MIS data
- NEDS data.

A weighted average for sulfur and ash content should be used for a fuel if not all the fuel has the same content. (For example, distillate oil with different sulfur contents may be supplied through different companies.) This weighted average factor is formed by weighting the quantity of fuel consumed by the sulfur or ash content of that quantity. Enter the sulfur and ash content data in Table 2.3.

9. Convert the county fuel use data in Table 2.1 to emissions by multiplying by:

- The emission factor from AP-42 or the NEDS emission factor file. Emissions from fuel combustion depend on the type and size of the boiler. If most of the boilers are the same type and size, the appropriate emission factor can be determined easily. If this is not the case, form weighted emission factors reflecting the mix of boiler type and size, based on data from distributors, servicemen or state registrations.

- The sulfur or ash content, if applicable

- For point sources, the equivalent control efficiency required by future emission regulations, including NSPS.

Enter emissions in Table 7.1.

(3) Transportation

1. Highway Vehicles

Procedures used to estimate emissions from highway vehicles have in the past considered three major vehicle classifications:

- Light-duty gasoline
- Heavy-duty gasoline
- Heavy-duty diesel.

These correspond identically to the vehicle categories given in the NER. Emission factors for these categories are given in AP-42. Highway vehicle categories have recently been expanded by EPA to include the following:

- Light-duty vehicles (LDV)
- Light-duty trucks (LDT)
- Heavy-duty gasoline vehicles (HDV)
- Heavy-duty diesel vehicles (HDD)
- Motorcycles (MC).

Emission factors for these categories from 1973 to 1985 are given in the Control Factor/Mobile Source document referenced in Chapter II.

The five category classification is recommended for estimating base year emissions provided that:

- Sufficient VMT data for each of the five categories are available
- The base year is 1973 or later, which is the earliest year for which emission factors are given in the Control Factor/Mobile Source document.

To be entered in Table 7.1, emissions from the five vehicle classification should be aggregated into the three vehicle classification as follows:

NER Category	Vehicle Type
Light-duty gasoline	Light-duty vehicles Light-duty trucks Motorcycles
Heavy-duty gasoline	Heavy-duty gasoline vehicles
Heavy-duty diesel	Heavy-duty diesel vehicles

The methodology which follows is valid for the three vehicle as well as the five vehicle classification.

(1) Determine measured county vehicles miles traveled for the five vehicle classifications:

- Light-duty vehicles
- Light-duty trucks
- Heavy-duty gasoline
- Heavy-duty diesel
- Motorcycles.

Consult highway, transportation or air quality studies. Enter VMT for all vehicles in Table 3.4 and proceed to Step 3. If only total county vehicle miles are measured and available from the sources given previously, but not VMT for each vehicle classification, proceed to Step 2.

(2) If only total county vehicle miles are available from the sources given, this total must be apportioned to the five vehicle types. Use data available from the highway department or transportation studies to disaggregate light- and heavy-duty mileage.

Light-duty vehicle mileage must be disaggregated into VMT for LDV, LDT and MC. Guidelines for doing so are still being developed by EPA. Until these guidelines are promulgated, estimate the portions based on highway department or transportation studies; enter VMT for LDV, LDT and MC in Table 3.4.

Disaggregate heavy-duty mileage into VMT for HD and HDD as follows. Determine diesel VMT from estimates of diesel fuel consumed in the county and the factor of 5.1 mpg for heavy-duty diesel vehicles; enter in Table 3.4. The heavy-duty gasoline VMT is the total heavy-duty VMT, minus heavy-duty diesel VMT. Enter in Table 3.4.

(3) To simplify this Level 2 inventory update, estimate the speed correction factor for LDV according to the general type of roads prevalent in the county. If the county is predominantly urban, use correction factors of:

- 0.8 for HC (exh) and CO
- 1.1 for NO_x.

If the county is predominantly rural, use correction factors of:

- 0.6 for HC (exh) and CO
- 1.3 for NO_x.

Enter the speed correction factors in Table 3.4.

(4) The age distribution of county LDV vehicles and the annual mileage driven by the vehicles of each age group must be considered to produce weighted emission factors for HC (exh), CO and NO_x for LDV. The equation for the weighted emission factor e_{np} for calendar year (n) and pollutant (p) is

$$e_{np} = \frac{\sum_i (c_i \times d_i \times f_i \times t_i)}{\sum f_i t_i}$$

where

i = age of vehicle

c_i = the federal test emission factor for the model year corresponding to vehicle age (i) at low mileage

d_i = the controlled pollutant (p) emission deterioration factor for model year (i) at calendar year n

f_i = fraction of total vehicles in use of age (i)

t_i = average annual miles driven by vehicle of age (i)

Note that this equation is equivalent to the one given in AP-42 and the Control Factor/Mobile Source document but is expressed in a slightly different form because in the above equation:

- The speed adjustment is assumed independent of vehicle age
- The expanded form of the weighted annual travel term (m_i in AP-42) is given.

A detailed discussion of this method, as well as test emission factors and nationwide data which can be used for f_i and t_i (if no local data are available) can be found in AP-42 and the Control Factor/Mobile Source document. Calculation of weighted emission factors using the above equation may be facilitated by using Table 3.2 as a step by step work sheet. Instructions for completing Table 3.2 are given starting on page III-46. Enter these weighted emission factors in Table 3.4. Enter emission factors for HC (evap), SO_x and particulates from the same sources in Table 3.4.

If emissions in the county from other gasoline vehicles (LDT, HDT or MC) are sufficient to justify including the effects of speed correction, vehicle age and model year distribution, proceed in the manner used for light-duty vehicles and enter the data in Table 3.4.

(5) To compute baseline emissions, multiply the baseline VMT by the speed correction factors (for HC (exh), CO, and NO_x only), and by the highway vehicle emission factors from the Control Factor/Mobile Source document (for light-duty gasoline vehicles use the weighted emission factors computed above). Add HC (exh) and HC (evap) emissions to produce total HC emissions, and enter baseline emissions in Table 7.1.

2. Off-Highway Vehicles

(1) Gasoline Vehicles

- Determine off-highway gasoline use from county fuel use data. Enter on lines 1-2, Table 3.1.
- If these data are not available, calculate farm tractor gasoline use by multiplying the number of gasoline tractors in use in the county by the consumption rate of

1000 gallons/tractor/year. If the number of gasoline tractors cannot be determined, assume 60 percent of all tractors use gasoline. Calculate all other off-highway gasoline use by multiplying county population by an average factor of 13 gallons/capita/year. Enter on lines 1-2, Table 3.1.

- Compute base year emissions by multiplying the fuel use for each category by the emission factors from AP-42, add to produce total off-highway gasoline emissions, and enter in Table 7.1.

(2) Diesel Vehicles

- Determine off-highway diesel use from county fuel use data. Enter on lines 3-5, Table 3.1.

- If these data are not available, calculate farm tractor diesel use by multiplying the number of diesel tractors in use in the county by the consumption rate of 1000 gallons/tractor/year. If the number of diesel tractors cannot be determined, assume 35 percent of all tractors use diesel fuel (LPG accounts for the remaining 5 percent). To calculate diesel use by construction equipment, consult construction industry representatives for estimated fuel usage. If that cannot be done, multiply non-building construction employment (from County Business Patterns) by an average factor of 5000 gallons/employee. Calculate all other off-highway diesel use by multiplying county population by an average factor of 7.4 gallons/capita/year. Enter on lines 3-5, Table 3.1.

  If this estimation must be used (because county fuel use data are not available), the results should be checked by estimating state totals using the same method and comparing on a state basis with literature data. Off highway gasoline sales are reported in Highway Statistics and off highway diesel sales in MIS.

- Compute base year emissions by multiplying the fuel use for each category by the emission factors from AP-42, add to produce total off-highway gasoline emissions, and enter in Table 7.1.

3. Rail

Determine the county diesel fuel use for rail operations from available data in transportation studies or directly from the railroads. If these data are not available, use state fuel consumption data from the MIS, and compute county share by scaling with miles of track in the county divided by miles of track in the state or approximate by county population share. Enter on line 6, Table 3.1.

4. Vessels

(1) Oil

Determine county fuel use from interviews with shippers or port authority. If this cannot be done, calculate dockside and underway components based on vessel movement date from Waterborne Commerce of the U.S.

- Dockside. Determine the average time in port from port authority (or use 3 days), then apportion oil use as follows: 1900 gallons/day for residual, 660 gallons/day for diesel.
- Underway. Usually diesel only. Determine total vessel diesel oil use from interviews or published data; then subtract dockside use, and apportion remainder to ports by tonnage. If these data are

not available, county vessel miles must be computed, and fuel use estimated by using 19 gallons/nautical mile for diesel, and 44 gallons/nautical mile for residual. See APTD-1135 for a complete discussion of this method.

(2) Coal

Determine county fuel use from interviews with shippers or port authority, or get state fuel use from Waterborne Commerce of the U.S.; calculate county share by computing the tonnage ratio and scaling state data.

(3) Gasoline

Determine fuel use from county data or from studies on leisure or recreation. If not available, interview gasoline dealers to obtain sales figures at recreation sites, or use 160 gallons/year/vessel and scale by boat registrations.

Enter fuel use by vessels (oil, coal, gasoline) as determined above on lines 7-10, Table 3.1. Compute base year emissions by multiplying fuel use by the emission factors from AP-42, and enter in Table 7.1.

5. Aircraft

The activity from which aircraft emissions are computed is landing and takeoff cycles (LTO). To determine baseline emissions from aircraft, use county LTO data by aircraft type; consult airports individually or county air transportation plans or studies. If these data are not available, determine state air traffic activity from FAA statistics and disaggregate to the county level based on county share of passengers and freight. Military activity should be included. Enter in column 1, Table 3.5. Compute base year emissions by multiplying base year LTO cycles for each aircraft type by the emission factors from AP-42, and enter in Table 7.1.

(4) Electric Generation Emissions

Determine which fuels are burned in the county to generate electricity (both internal and external combustion), the quantity of those fuels, and sulfur and ash content, if applicable, from:

- County or state utility commission data
- Regional Electric Reliability Council data
- Federal Power Commission Form 67.

Enter in columns 1-5, Table 4.1. A number of blank lines are provided in Table 5.1 to allow for a number of different fuels which may be used in the county; all lines may not be needed.

Convert the future fuel use data to emissions by multiplying by:

- The emission factor from AP-42 or the NEDS emission factor file. Emissions from electricity generation depend on the type and size of the boiler. If most of the boilers are the same type and size, the appropriate emission factor can be determined easily. If this is not the case, form weighted emission factors reflecting the mix of boiler type and size based on data from the references given above.

- The sulfur or ash content, if applicable

- For point sources, the equivalent control efficiency required by future emission regulations, including NSPS.

Enter emissions in Table 7.1.

(5) Incineration

Fill in Table 5.1 using county totals for incineration sources and methods. If county totals are not available, use state totals and compute county shares based on population. Consult county solid waste studies and officials and land-use plans. Convert this baseline activity to emissions by multiplying by the emission factors from AP-42, and enter in Table 7.1.

(6) Miscellaneous Area Sources

1. Evaporation

(1) Gasoline

Determine the total gasoline retail sales in the county, either through interviews with dealers or from the county or state tax agency. Enter the results in column 1, Table 6.1. Convert to base year emissions by multiplying by the emission factors from AP-42; enter in Table 7.1 on the line "gas handling evaporation loss" in the transportation (area) emissions category.

(2) Solvents

Estimate the amount of solvents used in the county from the baseline population and one of the following national average use factors:

- County population less than 100,000:
  - 3 lb/capita/yr
- County population 100,000 to 500,000:
  - 8 lb/capita/yr
- County population 500,000 to 1,000,000:
  - 18 lb/capita/yr
- County population greater than 1,000,000:
  - 28 lb/capita/yr.

The factors above refer to the total area source solvent use in the county, including dry cleaning, surface coating and industrial area sources. Enter this amount in Table 6.1. Convert to baseline emissions by multiplying by the appropriate emission factor from AP-42, and enter in Table 7.1, as the total for the solvent evaporation category, under miscellaneous area sources.

2. Other Miscellaneous Sources

Calculation of baseline and projected emissions for these miscellaneous sources is not included specifically in Chapters III and IV because procedures for estimating emissions from these sources which were not regarded as significant in the past are in the process of being modified and improved. The miscellaneous area source categories given in Tables 7.1 and 7.2 have been expanded from the categories given in the NEDS NER format, and reflect the increasing importance associated with these sources. Space for recording the calculations of miscellaneous emissions is provided in Table 6.2.

LEVEL 3 EMISSION INVENTORY UPDATE

The methods used in this section require not only data from local and national sources but current technical data obtained directly from detailed, in-depth interviews with plant representatives in the county responsible for the majority of the pollution. Data requirements for use in the interview program are given in the Appendix. Other data sources include:

- Waterborne Commerce of the U.S.
- Federal Highway Administration, Highway Statistics
- Industry association data on fuel use
- National census of transportation.

(1) Industrial Process Emissions

1. Method 1

(1) From the NEDS plant ID sort (total process emissions per plant), determine those plants which together produce 95 percent of particulate process emissions; do the same for the other four pollutants. This identifies the plants producing the largest emissions per plant.

(2) Because one plant may be a major source for one pollutant, but not for another pollutant, the plants determined above may produce more than 95 percent of the emissions in one category. Thus, a factor must be computed to correct the totals for those plants not interviewed. Add up from the county NER all the pollutants produced by the above plants and enter on line 1, Table 1.2. Enter the total process emissions from the county NER and enter on line 2, Table 1.2. Compute the correction factor (line 2 divided by line 1) for each pollutant and enter on line 3.

(3) Interview all those plants designated in Step 1 and determine current plant throughput for each SCC process. See data requirements, Figure 1. Multiply throughput for each SCC from each plant by the emission factors from NEDS and enter in columns 3-7, Table 1.3.

(4) Multiply each emission level for each SCC process by the correction factor for that pollutant (to correct for plants not interviewed) from Table 1.2 and enter the results in columns 9-13, Table 1.3.

(5) Sum emissions for all SCC processes in each NER process category and enter in Table 7.1.

Use Methods 2 or 3 if staff resources are not sufficient for Method 1.

2. Method 2

Follow the same procedure as given in Method 1, but use 90 percent instead of 95 percent as the cutoff point.

3. Method 3

Follow the same procedure as given in Method 1, but contact those plants producing 90 percent of the single most important pollutant instead of all five pollutants.

(2) Fuel Combustion Emissions

1. Identify those fuels which are consumed in the county in substantial amounts; include any fuel not shown on the NER but which is known to be used significantly.

2. Determine the total amount of each fuel consumed in the county, including gasoline and diesel used for stationary internal combustion. (This sometimes must be considered equivalent to the amount sold.) Consult:

- Fuel dealers
- County fuel use data
- Energy or air quality studies
- Industry associations (AGA, NPC, NCA).

This data search may include customer information. If not, the customer share of each fuel must be determined as follows:

- Residential. First determine from fuel dealers (or rely on county NER) whether any residual oil is used, and if so, determine the residual to distillate proportion. Then fuel use can be calculated as:

  (.01288 x D.D. + [30.41 x (avg rooms/h.u.)] + 79.54)/F, where

  D.D. = degree days

  h.u. = housing unit

  F = fuel heat constant factor for each fuel:

  - Anthracite coal: 22.0, for fuel use in tons
  - Bituminous coal: 25.0, for fuel use in tons
  - Natural gas: 1.0, for fuel use in thousand cubic feet
  - Distillate oil: 0.14, for fuel use in gallons
  - Residual oil: 0.15, for fuel use in gallons
  - Wood: 17.0, for fuel use in tons
  - LPG: 0.095, for fuel use in gallons.

- Industrial. Interview major polluters to determine types and quantity of fuel used for both internal and external combustion. Technical data to be requested are specified in Exhibit 1 in the Appendix.

- Commercial/Institutional. Interview major polluters including hospitals, hotels, schools, colleges, and laundries; determine type and quantity of fuel used for both internal and external combustion. Technical data to be requested are specified in Exhibit 2 in the Appendix.

3. The use of electricity, while producing no emissions at the point of consumption, must be considered when determining the base year Btu demand. Only the electricity used as a substitute for fuel combustion should be considered, however. This type of consumption includes primarily space heating and cooling, and does not include the use of electric appliances or industrial machinery. Determine the amount of electricity used for space heat in the state (or in the county, if that data are available) by each customer category (residential, industrial, commercial/institutional). The best source of this data is the Regional Electric Reliability Council.

4. Industrial and commercial/institutional fuel use for external combustion must be disaggregated into point and area sources. This can be done based on the interview results or county fuel statistics. (Allocation to point and area sources is not as important as determining accurate fuel use totals.) State or local air quality agencies may have a point source fuel use inventory. In this case, area source fuel use is given as the total fuel use minus the sum of the point source fuel use.

5. Determine the sulfur and ash content for coal, and the sulfur content for oil burned in the county. Consult the same sources that were used previously:

- Results of interviews with industries and fuel dealers

- Bureau of Mines and MIS data referenced in Chapter II

- Local emission inventory data.

A weighted average for sulfur and ash content should be used for a fuel if not all the fuel used in the county has the same content, e.g., distillate oil with different sulfur contents. This weighted average factor is formed by weighting the quantity of fuel consumed by the sulfur or ash content of that quantity.

6. Enter the above data in Tables 2.1 and 2.3.

7. Convert the fuel use data in Table 2.1 to emissions by multiplying by:

   - The emission factor from AP-42 or the NEDS emission factor file. Emissions from fuel combustion depend on the type and size of the boiler. If most of the boilers are the same type and size, the appropriate emission factor can be determined easily. If this is not the case, fuel consumption for each source should be multiplied by the emission factor for that source; the emissions should be aggregated to totals for each fuel.

   - The sulfur or ash content, if applicable.

   - For point sources, the equivalent control efficiency required by future emission regulations, including NSPS.

Enter emissions in Table 7.1.

(3) Transportation

1. Highway Vehicles

Procedures used to estimate emissions from highway vehicles have in the past considered three major vehicle classifications:

- Light-duty gasoline
- Heavy-duty gasoline
- Heavy-duty diesel.

These correspond identically to the vehicle categories given in the NER. Emission factors for these categories are given in AP-42. Highway vehicle categories have recently been expanded by EPA to include the following:

- Light-duty vehicles (LDV)
- Light-duty trucks (LDT)
- Heavy-duty gasoline vehicles (HDV)
- Heavy-duty diesel vehicles (HDD)
- Motorcycles (MC).

Emission factors for these categories are given in the Control Factor/Mobile Source document referenced in Chapter II. The five category classification is recommended for estimating base year emissions provided that:

- Sufficient VMT data for each of the five categories are available

- The base year is 1973 or later, which is the earliest year for which emission factors are given in the Control Factor/Mobile Source document.

To be entered in Table 7.1, emissions from the five vehicle classification should be aggregated into the three vehicle NER classification as follows:

NER Category	Vehicle Type
Light-duty gasoline	Light-duty vehicles Light-duty trucks Motorcycles
Heavy-duty gasoline	Middle-duty vehicles
Heavy-duty diesel	Heavy-duty diesel vehicles

If the three vehicle classification is to be used, proceed as given below. If the five vehicle classification is to be used, omit the following section and proceed to section (2).

(1) Three Vehicle Classification

1. Determine county VMT for each vehicle category from local traffic surveys or transportation studies.

2. If only total VMT for all vehicles are measured and available, follow the instructions given in Level 2 to compute VMT for each vehicle category.

3. The age distribution of county light duty vehicles and the annual mileage driven by the vehicles of each age group must be considered to produce weighted emission factors for HC (exh), CO and NO_x for light-duty vehicles. The equation for weighted emission factors appears on page 70. Table 3.2 is a step by step work sheet for performing the calculations specified by that equation; instructions for completing that Table are given below.

For light-duty gasoline vehicles, proceed as follows:

- The table references below are for Table 3.2 unless otherwise specified. Fill in line 2 with the model year corresponding to the vehicle age on line 1. A vehicle age of one year corresponds to the baseline year.

- Enter deterioration factors (Table 3.1.2-5 or 3.1.2-6 in AP-42) for vehicle age and model year on lines 7-9.

- Enter test emission factors (Table 3.1.2-1 or 3.1.2-2 in AP-42) on lines 10-15. If state mobile source emission regulations are more stringent, they should be used instead.

- On line 3, enter the fraction of total vehicles in use in the county for each age group. On line 4, enter the average miles traveled per year for vehicles of each age group. Note that the sum of the VMT fractions should equal one. Use state or county data for light-duty gasoline vehicles if they are available, otherwise use the national data in Table 3.1.2-7, AP-42.

- For each vehicle age group (each column), multiply line 3 by line 4 and enter in line 5. Add up all the entries in line 5 and enter in the far right column of line 5. For each vehicle age group (each column) divide line 5 by the sum for line 5 (shown as "$\Sigma f_i t_i$" in Table 3.2) and enter in line 6. This produces the weighted annual travel for each vehicle age group.

- Multiply weighted annual travel (line 6) by deterioration factors (lines 7-9) and by test emission factors (lines 10-15) to produce weighted emission factors, and enter on lines 16-21. Note that deterioration affects only HC (exhaust), CO and NO_x emissions.

- Fill in column 1, Table 3.3, with road speed categories, either

  - Urban (avg 25 mph), rural (avg 45 mph)

  - Limited access (avg 55 mph) rural (avg 45 mph), suburban (avg 35 mph), and urban (avg 25 mph)

  Average speeds other than the above may be used if they are more appropriate for the county.

- In column 2, Table 3.3, enter the fraction of VMT traveled at the corresponding road speed category. If local data are not available, refer to FHWA Highway Statistics and adjust the state proportions to county factors after consulting with the county highway department.

- From Figure 3.1.1-1 of AP-42, determine the speed correction factor for CO, NO_x, and HC (exhaust) for each average road speed category, and enter in columns 3-5, Table 3.3.

- For each line in Table 3.3, multiply column 2 by correction factors in columns 3-5 and enter in columns 6-8.

- Add up columns 6-8, Table 3.3, to produce a speed correction factor for HC (exhaust), NO_x and CO emissions. Enter in Table 3.4.

- To compute baseline emissions for light-duty gasoline vehicles, multiply the baseline VMT by the speed correction factors (for HC (exh), CO, and NO_x only), and by the highway vehicle emission factors from the Control Factor/Mobile Source document (for light-duty gasoline vehicles use the weighted emission factors computed above). Add HC (exh) and HC (evap) emissions to produce total HC emissions, and enter baseline emissions in Table 7.1.

4. For all other highway vehicles, proceed as follows:

- If emissions in the county from other gasoline vehicles (LDT, HDT or MC) are sufficient to justify including the effect of speed correction, vehicle age and model year distribution, complete a Table 3.2 and a Table 3.3 for those vehicle types.

- Otherwise, multiply VMT in Table 3.4 by the emission factors from AP-42 or the Control Factor/Mobile Source document to compute base year emissions, and enter in Table 7.1.

(2) Five Vehicle Classification

1. Determine county VMT for each vehicle category from local traffic surveys or transportation studies. Enter in Table 3.4.

2. If only total VMT for all vehicles are measured and available, follow the instructions given in Level 2 to compute VMT for each vehicle category. Enter in Table 3.4.

3. The age distribution of county LDV and the annual mileage driven by the vehicles of each age group must be considered to produce weighted emission factors for HC (exh), CO and NO_x for LDV. The equation for weighted emission factors appears on page 70. Table 3.2 is a step by step work sheet for performing the calculations specified by that equation; instructions for completing that Table are given below.

For light-duty vehicles (LDV), proceed as follows:

- The Table references below are for Table 3.2 unless otherwise specified. Fill in line 2 with the model year corresponding to the vehicle age on line 1. A vehicle age of one year corresponds to the baseline year.

- Since the effect of deterioration of pollution control devices with age is included in the emission factors given in the Control Factor/Mobile Source document, leave lines 7-9 blank.

- Enter test emission factors on lines 10-15 from Control Factor/ Mobile Source document.

- On line 3, enter the fraction of total vehicles in use in the county for each age group. On line 4, enter average miles traveled by vehicles of each age group. Note that the sum of the VMT fractions should equal one. Use either the national data in Table 3.1.2.7 in AP-42, or state or county data for light-duty gasoline vehicles if they are available.

- For each vehicle age group (each column), multiply line 3 by line 4 and enter in line 5. Add up all the entries in line 5 and enter in the far right column of line 5. For each vehicle age group (each column) divide line 5 by the sum for line 5 (shown as "$\Sigma f_i t_i$" in Table 3.2) and enter in line 6. This produces the weighted annual travel for each vehicle age group.

- Multiply weighted annual travel (line 6) by test emission factors (lines 10-15) to produce weighted emission factors, and enter on lines 16-21.

- Fill in column 1, Table 3.3, with road speed categories, either

    - Urban (avg 25 mph), rural (avg 45 mph)

    - Limited access (avg 55 mph), rural (avg 45 mph), suburban (avg 35 mph), and urban (avg 25 mph)

Average speeds other than the above may be used if they are more appropriate for the county.

- In column 2, Table 3.3, enter the fraction of VMT traveled at the corresponding road speed category. If local data are not available, refer to FHWA Highway Statistics and adjust the state proportions to county factors after consulting with the county highway department.

- From the Control Factor/Mobile Source document, determining the speed correction factor for CO, NO_x, and HC (exhaust) for each average road speed category, and enter in columns 3-5, Table 3.3.

- For each line in Table 3.3, multiply column 2 by corrections factors in columns 3-5 and enter in columns 6-8.

- Add up columns 6-8, Table 3.3, to produce a speed correction factor for HC (exhaust), NO_x and CO emissions. Enter in Table 3.4.

- To compute baseline emissions for light-duty gasoline vehicles, multiply the baseline VMT by the speed correction factors (for HC (exh), CO, and NO_x only), and by the highway vehicle emission factors from the Control Factor/Mobile Source document (for light-duty gasoline vehicles use the weighted emission factors computed above). Add HC (exh) and HC (evap) emissions to produce total HC emissions, and enter baseline emissions in Table 7.1.

4. For all other highway vehicles, proceed as follows:

- If emission in the county from other gasoline vehicles (LDT, HDV or MC) are sufficient to justify including the effect of speed correction, vehicle age and model year distribution, complete a Table 3.2 and a Table 3.3 for these vehicle types.

- Otherwise, multiply VMT in Table 3.4 by the emission factors from the Control Factor/Mobile Source document to compute base year emissions, and enter in Table 7.1.

2. Off-Highway Vehicles

(1) Gasoline Vehicles

- Determine off-highway gasoline use from county fuel use data. Enter on lines 1-2, Table 3.1.

- If these data are not available, calculate farm tractor gasoline use by multiplying the number of gasoline tractors in use in the county by the consumption rate of 1000 gallons/tractor/year. If the number of gasoline tractors cannot be determined, assume 60 percent of all tractors use gasoline. Calculate all other off-highway gasoline use by multiplying county population by an average factor of 13 gallons/capita/year. Enter on lines 1-2, Table 3.1.

- Compute base year emissions by multiplying the fuel use for each category by the emissions factors from AP-42, add to produce total off-highway gasoline emissions, and enter in Table 7.1.

(2) Diesel Vehicles

- Determine off-highway diesel use from county fuel use data. Enter on lines 3-5, Table 3.1.

- If these data are not available, calculate farm tractor diesel use by multiplying the number of diesel tractors in use in the county by the consumption rate of 1000 gallons/tractor/year. If the number of diesel tractors cannot be determined, assume 35 percent of all tractors use diesel fuel (LPG accounts for the remaining 5 percent). To calculate diesel use by construction equipment, consult construction industry representatives for estimated fuel usage. If that cannot be done, multiply non-building construction employment (from County Business Patterns) by an average factor of 5000 gallons/employee. Calculate all other off-highway diesel use by multiplying county population by an average factor of 7.4 gallons/capita/year. Enter on lines 3-5, Table 3.1.

  If this estimation method must be used (because county fuel use data are not available), the results should be checked by estimating state totals using the same method and comparing on a state basis with literature data. Off highway gasoline sales are reported in Highway Statistics and off highway diesel sales in MIS.

- Compute base year emissions by multiplying the fuel use for each category by the emission factors from AP-42, add to produce total off-highway gasoline emissions, and enter in Table 7.1.

3. Rail

Determine the county diesel fuel use for rail operations from available data in transportation studies or directly from the railroads. If these data are not available, use state fuel consumption data from the MIS, and compute county share by scaling with miles of track in the county divided by miles of track in the state or approximate by county population share. Enter on line 6, Table 3.1.

4. Vessels

(1) Oil

Determine county fuel use from interviews with shippers or port authority. If this cannot be done, calculate dockside and underway components based on vessel movement data from Waterborne Commerce of the U.S.

- Dockside. Determine the average time in port from port authority or shippers (or use 3 days), then apportion oil use as follows: 1900 gallons/day for residual, 660 gallons/day for diesel.

- Underway. Usually diesel only. Determine total vessel diesel oil use from interviews or published data; then subtract dockside use, and apportion remainder to ports by tonnage. If these data are not available, county vessel miles must be computed, and fuel use estimated by using 19 gallons/nautical mile for residual. See Chapter 5 of APTD-1135 for a complete discussion of this method.

(2) Coal

Determine county fuel use from interviews with shippers or port authority, or get state fuel use from Waterborne Commerce of the U.S.; calculate county share by computing the tonnage ratio and scaling state data.

(3) Gasoline

Determine fuel use from county data or from studies on leisure or recreation. If not available, interview gasoline dealers to obtain sales figures at recreation sites, or use 160 gallons/year/vessel and scale by boat registrations.

Enter fuel use by vessels (oil, coal, gasoline) as determined above on lines 7-10, Table 3.1. Compute base year emissions by multiplying fuel use by the emission factors from AP-42, and enter in Table 7.1.

5. Aircraft

The activity from which aircraft emissions are computed is landing and takeoff cycles (LTO). To determine baseline emissions from aircraft, use county LTO data by aircraft type; consult airports individually or county air transportation plans or studies, or FAA data. If these data are not available, determine state air traffic activity from FAA statistics and disaggregate to the county level based on county share of passengers and freight. Military activity should be included. Enter in column 1, Table 3.5. Compute base year emissions by multiplying base year LTO cycles for each aircraft type by the emission factors from AP-42, and enter in Table 7.1.

(4) Electric Generation

Interview individual power companies to determine base year fuel use for boilers and internal combustion within the

3. Rail

Determine the county diesel fuel use for rail operations from available data in transportation studies or directly from the railroads. If these data are not available, use state fuel consumption data from the MIS, and compute county share by scaling with miles of track in the county divided by miles of track in the state or approximate by county population share. Enter on line 6, Table 3.1.

4. Vessels

(1) Oil

Determine county fuel use from interviews with shippers or port authority. If this cannot be done, calculate dockside and underway components based on vessel movement data from Waterborne Commerce of the U.S.

- Dockside. Determine the average time in port from port authority or shippers (or use 3 days), then apportion oil use as follows: 1900 gallons/day for residual, 660 gallons/day for diesel.

- Underway. Usually diesel only. Determine total vessel diesel oil use from interviews or published data; then subtract dockside use, and apportion remainder to ports by tonnage. If these data are not available, county vessel miles must be computed, and fuel use estimated by using 19 gallons/nautical mile for residual. See Chapter 5 of APTD-1135 for a complete discussion of this method.

county, sulfur and ash content of fuels burned, and pollution control efficiencies. Enter the data obtained in columns 1-5, Table 4.1.

Convert the future fuel use data to emissions by multiplying by:

- The emission factors derived from stack test data obtained from power companies, if available. Otherwise use the emission factor from AP-42 or the NEDS emission factor file. Emissions from electricity generation depend on the type and size of the boiler. If most of the boilers are the same type and size, the appropriate emission factor can be determined easily. If this is not the case, fuel consumption for each source should be multiplied by the emission factor for that source; the emissions should be aggregated to totals for each fuel.
- The sulfur or ash content, if applicable.
- For point sources, the equivalent control efficiency required by future emission regulations, including NSPS.

Enter emissions in Table 7.1.

(5) Incineration

Fill in Table 5.1 with base year incineration levels. The best sources of point source data are the agencies and organizations responsible for these sources. In addition, consult solid waste studies and land-use plans. Convert this baseline activity to emissions by multiplying by the emission factors from AP-42 and enter in Table 7.1.

(6) Miscellaneous Area Sources

1. Evaporation

(1) Gasoline

Determine the total gasoline retail sales in the county, either through interviews with dealers or from the county or state tax agency. Enter the results in column 1, Table 6.1. Convert to base year emissions by multiplying by the emission factors from AP-42; enter in Table 7.1, on the line "gas handling evaporation loss" in the transportation (area) emissions category.

(2) Solvents

Determine the amount of solvents used from county sales totals, and determine retail sales of surface coating materials to the public and commercial/institutional consumers. If the amounts are given in gallons, convert to weight by using the actual density, or if that cannot be determined, use an average density of 6.7 lb/gallon. Enter the result in column 1, Table 6.1. Convert to base year emissions by multiplying from the emission factors from AP-42. Enter emissions in Table 7.1; the emissions from solvent use should be entered in the solvent evaporation category under miscellaneous (area) sources. If emissions were computed for the three major types of evaporative sources (industrial area, surface coating and dry cleaning), these totals should be entered individually; otherwise enter the total.

2. Other Miscellaneous Sources

Calculation on baseline and projected emissions for these miscellaneous sources is not included specifically in Chapters III and IV because procedures for estimating emissions from these sources which were not regarded as significant in the past are in the process of being modified and improved. The miscellaneous area source categories given in Tables 7. 1 and 7. 2 have been expanded from the categories given in the NEDS NER format, and reflect the increasing importance associated with these sources. Space for recording the calculations of miscellaneous emissions is provided in Table 6. 2.

IV. FORECAST PROCEDURES

This chapter of the manual presents instructions for developing forecasts of air pollutant emissions. The forecasts are based on point and area source emission inventories as updated and expanded by the procedures given in Chapter III. The aggregated results presented in standard National Emission Report format are to be recorded in Table 7.2. The projection procedures have been divided into three levels analogous to those used in developing the baseline emissions data. The level chosen will depend on:

- The availability of resources
- The degree of accuracy required
- The amount of resources expended in upgrading the baseline inventory.

Chapters I and II of the manual should be read before beginning the forecast procedures. A general sequence of steps to complete both the baseline and projection chapters, including the preparation and documentation phases, is given in Chapter I, under Project Organization and Planning.

The manual is intended to provide guidance and direction for projecting future emissions. The specific procedures and data sources given are not the only valid methods and sources which may be used; they are presented in order to illustrate both the type of data which must be identified, and the general manner of forecasting future activity, and to identify the elements which must be considered in projecting a complete and accurate future emission inventory. The manual methodology is deliberately general so as to have the greatest possible applicability to any geographic area in the country. But, it must be recognized that there is a wide disparity among counties with respect to number, type and location of emission sources and their expected growth patterns. As a result, some of the estimating techniques discussed herein may not be directly applicable to every county.

The manual has been designed to provide flexibility for local initiative and data input. This is a valuable feature because the

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personnel at the county level responsible for completion of the manual will in many cases have most immediate access to some of the best data for making growth projections.

In particular the user is encouraged to

- Improve on the methodologies given if he is familiar with more accurate or appropriate emission projection methods
- Use any additional data which he feels is more accurate or timely than that obtained from referenced sources
- Substitute local emission factors for those published by EPA if they are felt to be more accurate
- Communicate often with knowledgeable personnel in the appropriate state or local agencies who may be able to provide assistance or expertise
- Use computerized data processing systems if they are available and resources permit.

In some cases, alternate projection methods are specified. Whenever the methods producing more accurate results are not identified, the user should assume they are roughly equivalent. Whenever a number of alternate data sources are cited and the most preferable ones are not identified, the user must decide which are more applicable based on the type and detail of the data contained in each and the timeliness of that data.

The tables in the Appendix provide tabulating work sheets and a uniform documentation format for preserving the data developed. If the user prefers to document the data and projection methods in another way and does not require the work sheets for assistance, these tables may be disregarded.

Forecasting future emission levels involves not only projecting changes in activity levels, but also includes the effect of emission control regulations to be implemented in the future. Such control regulations are likely to be specified in one of the following forms:

- Maximum allowable pollutant concentration
- Maximum allowable weight of pollutant per unit fuel or throughput

- Minimum removal efficiency (or maximum percent of uncontrolled emissions)

- Maximum allowable sulfur or ash content of fuel.

Future emissions from each point source will be projected in the following way:

- Determine base year activity (fuel use, tons of waste burned or plant throughput). This is the output of Chapter III.

- Scale base year activity by a dimensionless growth factor to project future activity levels. Procedures for developing growth factors are given in this Chapter.

- Compute future uncontrolled emissions by multiplying future activity by the emission factors given by NEDS.

- Reduce future emissions by required future controls to project net emissions. To do this it is necessary to express all control regulations (whether in terms of concentration, weight of pollutant per unit fuel, feed or throughput, sulfur/ash content, or removal efficiency) in terms equivalent to removal efficiency based on externally uncontrolled emissions. In other words, the effect of any future control standard must be translated to the equivalent removal efficiency which would produce the same reduction in externally uncontrolled emissions.

This can be expressed in equation form as:

(future emissions) = (base year activity) x (growth factor) x (emission factor) x (1 - equivalent control efficiency).

The recommended source documents for emission factors are AP-42 and the NEDS emission factor file. For area sources AP-42 must be used since the NEDS file contains no area source factors. For point sources either can be used, but the NEDS file is preferable because it is used by the NEDS emission inventory system.

Apportioning degree of emission control to activity changes is affected further by four more considerations:

- Early compliance with new source performance standards

- Variance from emission regulations

- Replacement of operating equipment due to obsolescence
- Increase in plant output with no change in plant output capacity (utilization of idle capacity).

When projecting emissions for one plant with a moderate number of sources, it is possible that all of the above factors might be encountered in attempting to scale baseline activity by the appropriate growth factor. The situation becomes more complex when all the plants in a geographic region are being considered. Ideally, the most accurate approach to the projections would be to include in the baseline data the extent of control for each point source in the baseline year. It may be possible to do this for Level 3 projections which address each point source individually; for Level 1 and Level 2 projections, however, the effect of all these factors must be estimated in an aggregate manner. The methodology given previously should be used in Level 3 for point source specific projections; if aggregate estimation methods must be used, the best source of equivalent emission control data and the plant information listed above would be the state or local air quality agency.

A more thorough discussion of the implications of these considerations, and a recommended method for including them in the projections, is given in Chapter I, page 17.

The classification scheme recommended for categorizing industrial process emissions is the SCC code because most emission control regulations and emission factors are specified on that basis. While the NEDS emission inventory is also classified in that way, other local emission inventories may be based on an industrial classification such as SIC codes. In that case a mapping or correlation between the classification systems must be developed.

One growth factor which will be used many times in projecting emission levels is the increase in county population. Determination of this parameter can be done in a number of ways:

- In many cases individual counties develop their own population projections, based usually on housing construction data (building permits, etc.). These projections are probably most valid for the near-term. County population projections may also be based on employment projections obtained from commercial and industrial organizations.

Further information on projecting population growth factors for small geographical areas is contained in Volume 4 of the AQMA Guideline series published by EPA (Land Use and Transportation Considerations, August 1974).

- If the above data are not available, there may be similar projections for the entire state and the growth portion for the county could be based on historical trends. The use of trend analysis involves introducing potential errors. If a county has historically grown slowly but is on the edge of a rapidly expanding urban area, its future growth may be much greater than historical trends would indicate. Conversely, if a county has experienced recent rapid growth, then growth may tend to taper off in the future, particularly if land-use plans or sewer moratoriums constrain growth. Local information is required to refine the results of simple trend analysis to account for these factors.
- As a last resort, use OBERS* projections for the AQCR or SMSA to estimate population growth for the county.

A combination of the above methods could be used to generate a composite or average population growth factor.

Two other growth factors should be computed; they should be used primarily for reference and comparison when other growth factors are derived which are process specific. These are aggregate growth factors for the AQCR or SMSA for the manufacturing and commercial/institutional sectors, and are computed from the OBERS projections for the AQCR or SMSA. The unit of economic activity used in the OBERS projections is earnings (in constant 1967 dollars). Earnings are the sum of wages and salaries, other labor income, and proprietors' income. Using constant dollars eliminates inflation effects and enables only real growth to be estimated. Industrial economic data as expressed in other sources is sometimes given in different terms, such as value added or total gross output. Using any of these units to produce dimensionless growth factors is valid as long as their use is consistent (i.e., the same units for base year and projection year). The projection methodology is based on the fundamental assumption that a change in pollution producing activity is proportional to a change in purely economic indicators.

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* Projections of population, employment and earnings developed by the U.S. Departments of Commerce and Agriculture. For further information see page 35.

The growth factor for the manufacturing sector is derived from earnings projections for the OBERS major industrial category "manufacturing" (there are nine major industrial categories given in OBERS). The growth factor for a projection year is defined as the ratio of manufacturing sector earnings for the projection year, to manufacturing sector earnings for the base year. The growth factor for the commercial/institutional sector is derived from earnings projections for the major OBERS categories:

- Contract construction
- Wholesale and retail trade
- Finance, insurance and real estate
- Services
- Civilian government, a subcategory of the major category, government.

Before the pollutant forecasts are initiated, the most accurate population projection possible and the growth factors for the manufacturing and commercial/institutional sectors should be prepared and plotted as shown schematically in Exhibit 3 in the Appendix.

LEVEL 1 EMISSION PROJECTIONS

In addition to the population data discussed previously, the data required to complete the projections at this level include:

- OBERS earnings projections for the AQCR in which the county is located, or county projections if available
- State implementation plans and pertinent point and area source control regulations including compliance schedules, new source performance standards, and vehicle emissions standards
- Projections of growth in electric power generating facilities in the county (if any).

Projecting future point source emissions involves not only projecting changes in activity levels, but also includes the effect of emission control regulations to be implemented in the future. The procedure recommended for including future controls in the projections, given in Chapter I starting on page 17, involves calculating the equivalent removal efficiencies based on externally uncontrolled emissions. In addition, point source emission projections should include four other considerations:

- Early compliance with new source performance standards
- Variance from emission regulations
- Replacement of operating equipment due to obsolescence
- Increase in plant output with no change in plant output capacity.

(1) Industrial Process Emissions

The most accurate method for projecting industrial process emissions involves forecasting on an individual point source basis rather than on an aggregated source basis. This is because source specific data on base year emission control and operating capacity is needed to determine the equivalent source activity level and projected net emissions in the future as affected in the county must be computed.* Enter in columns 5-9, Table 1.4.

- Scale the baseline emissions (columns 9-13, Table 1.3) by the process category growth factor and SCC control factors to produce future emissions. Add emissions for all processes in each NER category to give NER process category totals, and enter the results in Table 7.2.

(2) Fuel Combustion

Fuel combustion emissions are projected by first determining the future fuel energy demand (in Btus) and then apportioning that demand to the fuels which are likely to be used.

1. Convert the county baseline fuel use in Table 2.1 to Btu equivalents and enter in Table 2.6. To do this it is necessary to add up the Btus for both point and area source combustion of each fuel. Since the Btu content of fuels shows substantial variation regionally, use the Btu equivalent which is appropriate for the region in question. Then compute the projected Btu demand as follows:

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* The weighted control factor CFW_{jp} for process category (j) and pollutant (p) is given by:

$$CFW_{jp} = \frac{\sum_i O_i \, ECF_{pi}}{\sum_i O_i}$$

where:

i = specific SCC process within process category (j)

O_i = future throughput for process (i)

ECF_i = equivalent control efficiency required in the projection year for pollutant (p) and process (i)

by future control requirements. Consequently, Level 3 projection is recommended for industrial process emissions because that method does consider individual sources. Substantially less confidence should be placed in Level 1 and Level 2 projections, in which sources are treated at an aggregated level.

Two alternate methods are given below for Level 1 projections of process emissions. The first method does not consider industrial processes within a NER category, while the second method does. Thus the second method is the more accurate of the two and is recommended if resources permit.

1. Method 1

- For each projection year, determine growth factor for each of the 13 NER process categories from OBERS industrial growth projections for the AQCR or from better local data, if available. For each process, the growth factor is given by: (earnings in projection year)/(earnings in baseline year). The growth factors, as derived from OBERS projections, are intended to reflect the change in industrial output for each process from the base year to the projection years. It may be necessary to interpolate between OBERS projection years to calculate earnings for the desired projection year. Enter the growth factor in column 12 of Table 1.1. (One Table 1.1 must be completed for each projection year.)

- From applicable local control regulations or the Control Factor/Mobile Source document, estimate the equivalent control efficiency required for each pollutant, for each process category, for each projection year. To do this a weighted control factor reflecting both the control required for each process within a process category, and the process throughput mix in the county must be computed. Enter in columns 13-17 of Table 1.1.

- Multiply the baseline emissions (columns 2-13, Table 1.3) by the growth factor (column 12, Table 1.1) and control factors (columns 13-17, Table 1.1) to produce future emissions and enter the results in Table 7.2.

2. Method 2

In completing these calculations, consider only those categories of the 13 NER process categories which have substantial emissions in the county.

- For each process category, list by 8-digit SCC (EPA source classification code) and process name all processes for which substantial emissions are produced in the county.

- Determine a growth factor for each process category from OBERS industrial growth projections for the AQCR. For each process category, the growth factor is given by: (earnings in projection year)/(earnings in baseline year). Enter in column 3 of Table 1.4. (One Table 1.4 must be completed for each projection year.)

- From data on applicable local control regulations or the Control Factor/Mobile Source document, estimate equivalent control efficiency required for each pollutant relative to the baseline year, for each SCC process, for each projection year. To do this a weighted control factor reflecting both the control required for each process within a process category, and the future process throughput mix in the county must be computed.[*] Enter in columns 5-9, Table 1.4.

- Scale the baseline emissions (columns 9-13, Table 1.3) by the process category growth factor and SCC control factors to produce future emissions. Add emissions for all processes in each NER category to give NER process category totals, and enter the results in Table 7.2.

(2) Fuel Combustion

Fuel combustion emissions are projected by first determining the future fuel energy demand (in Btus) and then apportioning that demand to the fuels which are likely to be used.

1. Convert the county baseline fuel use in Table 2.1 to Btu equivalents and enter in Table 2.6. To do this it is necessary to add up the Btus for both point and area source combustion of each fuel. Since the Btu content of fuels shows substantial variation regionally, use the Btu equivalent which is appropriate for the region in question. Then compute the projected Btu demand as follows:

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[*] The weighted control factor CFW_{jp} for process category (j) and pollutant (p) is given by:

$$CFW_{jp} = \frac{\sum_i O_i \, ECF_{pi}}{\sum_i O_i}$$

where:

i = specific SCC process within process category (j)

O_i = future throughput for process (i)

ECF_i = equivalent control efficiency required in the projection year for pollutant (p) and process (i)

- Residential. Scale the county baseline Btu demand (Table 2.6) by the population growth factor.

- Industrial. Scale the county baseline Btu demand (Table 2.6) by the growth factor for the manufacturing sector computed from OBERS data, as given in the beginning of this Chapter.

- Commercial/Institutional. Scale the county baseline Btu demand (Table 2.6) by the growth factor for the commercial/institutional sector computed from OBERS data, as given in the beginning of this Chapter.

The expected effect of energy conservation practices should be considered when computing these growth factors. Enter the growth factors and projected Btu demand in Table 2.7.

2. Predict the future fuel mix for the county based on local knowledge and data concerning historical fuel use trends and future fuel availability. In the absence of any such data, use the same fuel mix as in the baseline year.

One method for estimating the future fuel mix is to distribute the projected Btu demand to various fuels directly (such as a percentage for natural gas, a percentage for distillate oil, etc.). There is another method which, based on the available projection data, may be easier to implement. The latter method involves:

- First distributing only the net increase in the Btu demand to the fuels expected to be used to meet that demand

- Determining the net effect of conversion of existing combustion equipment to burn other fuels

- Using this data to make the fuel distribution of the projected Btu demand.

The use of electricity, while producing no emissions at the point of consumption, must be considered when distributing the projected Btu demand to various fuels. Only the electricity used as a substitute for fuel combustion should be considered, however. This type of consumption includes primarily space heating and cooling, and does not include the use of electric appliances or industrial machinery. Determine the amount of electricity projected for space heat in the state (or in the county, if those data are available) by each customer category (residential, industrial, commercial/institutional). The best source of this data is the Regional Electric Reliability Council.

Enter future county fuel use in Table 2.8; one Table 2.8 must be completed for each projection year.

3. Enter the projected sulfur and ash content in Table 2.2, based on the allowable maximum or baseline sulfur and ash content, whichever is smaller.

4. Convert the future fuel use data to emissions by multiplying by:

- The emission factor from AP-42 or the NEDS emission factor file. Emissions from fuel combustion depend on the type and size of the boiler. If most of the boilers are expected to be the same type and size, the appropriate emission factor can be determined easily. If this is not the case, estimate future weighted emission factors reflecting the mix of boiler type and size, based on data from distributors, servicemen or state registrations.
- The sulfur or ash content, if applicable.
- For point sources, the equivalent control efficiency required by future emission regulations, including NSPS.

5. Enter future emissions in Table 7.2.

(3) Transportation

1. Highway Vehicles

Procedures used to estimate emissions from highway vehicles have in the past considered three major vehicle classifications:

- Light-duty gasoline
- Heavy-duty gasoline
- Heavy-duty diesel.

These correspond identically to the vehicle categories given in the NER. Emission factors for these categories are given in AP-42. Highway vehicle categories have recently been expanded by EPA to include the following:

- Light-duty vehicles (LDV)
- Light-duty trucks (LDT)
- Heavy-duty gasoline vehicles (HDV)
- Heavy-duty diesel vehicles (HDD)
- Motorcycles (MC).

Emission factors for these categories are given in the Control Factor/Mobile Source document referenced in Chapter II. The five category classification is recommended for projecting emissions because of the increased accuracy resulting from the more detailed vehicle classification. To be entered in Table 7.2, emissions from the new five vehicle classification should be aggregated into the three vehicle NER classification as follows:

NER Category	Vehicle Type
Light-duty gasoline	Light-duty vehicles Light-duty trucks Motorcycles
Heavy-duty gasoline	Heavy-duty gasoline vehicles
Heavy-duty diesel	Heavy-duty diesel vehicles

If baseline VMT for highway vehicles was computed only for the three vehicle category classification, that data must first be disaggregated to the five category classification. Consult state or county transportation or highway data.

To project emissions:

(1) Assume growth factors for all five classes of vehicles to be given by the county population growth factor, and enter in Table 3.4. One Table 3.4 must be completed for each projection year.

(2) The age distribution of county LDV vehicles and the annual mileage driven by the vehicles of each age group (in years) must be considered to produce weighted emission factors for HC (exh), CO and NO_x for LDV. The equation for the weighted emission factor e_{np} for calendar year (n) and pollutant (p) is:

$$e_{np} = \frac{\sum_i (c_i \times d_i \times f_i \times t_i)}{\sum_i f_i t_i}$$

where:

i = age of vehicle

c_i = the federal test emission factor for the model year corresponding to vehicle age (i) at low mileage

d_i = the controlled pollutant (p) emission deterioration factor for model year (i) at calendar year n

f_i = fraction of total vehicles in use of age (i)

t_i = average annual miles driven by vehicle of age (i)

Note that this equation is equivalent to the one given in the Control Factor/Mobile Source document but is expressed in a slightly different form because in the above equation:

- The speed adjustment is assumed independent of vehicle age
- The expanded form of the weighted annual travel term (m_i in AP-42) is given.

A detailed discussion of this method, as well as test emission factors and nationwide data which can be used for f_i and t_i (if no local data are available) can be found in AP-42 and the Control Factor/Mobile Source document. Calculation of weighted emission factors using the above equation may be facilitated by using Table 3.2 as a step by step work sheet. Instructions for completing Table 3.2 are given starting on page 84. Enter these weighted emission factors for HC (evap), SO_x and particulates from the same documents in Table 3.4.

(3) If detailed speed correction factors were computed in the emission inventory update in Chapter III, use the same factors for emission projections. Otherwise, to simplify this Level 1 projection, estimate the speed correction factor for LDV according to the general type of roads prevalent in the county. If the county is predominantly urban, use correction factors of:

- 0.8 for HC (exh) and CO
- 1.1 for NO_x.

If the county is predominantly rural, use correction factors of:

- 0.6 for HC (exh) and CO
- 1.3 for NO_x.

Enter the speed correction factors in Table 3.4.

(4) If emissions in the county from other gasoline vehicles (LDT, HDT or MC) are sufficient to justify including the effects of speed correction, vehicle age and model year distribution, proceed in the manner used for LDV and enter the data in Table 3.4.

(5) For projected HC (ex[illegible]) and NO_x emissions for LDV, scale the ba[illegible] VMT (Table 3.4) by the growth factor (g), weig[illegible]mission factors (e) and speed correction factors ([illegible]g., VMT • g • e • s). For projected HC (evap), SO_x and particulate emissions, for LDV, and for all projected emissions for the other vehicle categories, scale the baseline VMT for all vehicles by the growth factors and emission factors. Add HC (exh) and HC (evap) emissions to produce total HC emissions, aggregate projected emissions into the NER vehicle format, and enter in Table 7.2.

2. Off-Highway Vehicles

(1) Compute a growth factor reflecting the expected overall change in agricultural activity and apply it to all off-highway gasoline vehicles. Enter on lines 1-2, Table 3.1. Compute a growth factor reflecting the expected overall change in construction activity and apply it to all off-highway diesel vehicles. Enter on lines 3-5, Table 3.1.

(2) Determine growth factors for any other major off-highway sources and enter in Table 3.1.

(3) Multiply the baseline fuel use by these growth factors and enter in the appropriate columns of Table 3.1. Scale projected fuel use by the emission factors from AP-42, add total projected emissions for off-highway gasoline and diesel use, and enter in Table 7.2.

3. Rail

Determine growth factors for diesel locomotive use based on projections for increases in rail traffic; consult transportation studies or contact the railroads directly. Enter the growth factors on line 6, Table 3.1. Scale baseline fuel use by the growth factors and emission factors from AP-42, and enter projected emissions in Table 7.2.

4. Vessels

Compute emissions resulting from vessel traffic as follows:

(1) Commercial Vessels Consuming Coal and Oil

Determine the appropriate growth factor for vessel movement based on:

- Interviews with shippers and port authority officials to determine the estimated increase in vessel traffic within county boundaries
- Consulting county or state transportation studies
- Projections of national vessel traffic from the U.S. Department of Transportation which can be disaggregated to the county level by base year tonnage ratios (county shipping tonnage/national shipping tonnage).

Enter on lines 7-9 of Table 3.1. Scale baseline fuel use by these growth factors and emission factors, and enter projected emissions in Table 7.2.

(2) Recreational Vessels Consuming Gasoline

Enter population growth factors on line 10, Table 3.1. Scale baseline fuel use by these growth factors and the emission factors from AP-42, and enter projected emissions in Table 7.2.

5. Aircraft

First consult the following sources of data:

- Transportation studies and individual airport studies
- State air traffic projection data from FAA (obtain projected county share by using present share)
- National air traffic forecasts from FAA, if none of the above sources have the required data.

For each projection year, determine two growth factors reflecting the expected change in overall air traffic for:

- Civil and commercial aircraft
- Military aircraft.

Scale baseline LTO cycles for civil and commercial aircraft by the first growth factor, and military aircraft by the second growth factor. This assumes the aircraft mix in the two general categories will remain static. Enter the growth factors in columns 2, 4 and 6, Table 3.5; scale the baseline LTO cycles for aircraft type by the appropriate growth factor for each projection year, and enter the results in columns 3, 5 and 7, Table 3.5. Project emissions by multiplying projected activity (LTO cycles) by the appropriate emission factors from AP-42. Aggregate emissions for these aircraft types into NER categories (commercial, civil and military) and enter in Table 7.2.

(4) Electric Generation

The forecasts made in this section will be based on available data on new power plant sites and anticipated fuel type. Such data is available for the near-term (less than 10 years) but is more speculative for the long-term. Because emissions will increase abruptly when a new fossil fuel plant comes on line, it is essential to determine as precisely as possible the year in which that will occur, even though it may not be one of the three forecast years being considered. Indicate in a footnote to the appropriate forecast table the projected year of start-up for the facility. The procedures to be used in preparing the electric generation emissions forecast are as follows:

1. Determine the amount of electricity to be generated in the county in the projection years, and enter in column 1, Table 4.2. To obtain this data consult:

   - County or state utility commission
   - Regional Electric Reliability Council
   - FPC Form 67
   - Steam Electric Plant Factors (National Coal Association).

2. Determine which fuels will be burned (both internal and external combustion) to produce that electricity, and enter percent of the electricity generated by each fuel in column 3.

3. Determine the conversion factor (kWh/unit fuel) for the geographic region of interest from above sources, and enter in column 4. (Future conversion factors will differ from basic year.)

4. Compute the future use of each fuel type by multiplying the total electric power to be generated (column 1) by the use percentage and conversion factor (columns 2 and 3), and enter in column 5.

5. Enter the sulfur and ash content for those fuels from Table 2.3 in columns 6 and 7.

6. Convert the future fuel use data to emission by multiplying by:

- The emission factor from AP-42 or the NEDS emission factor file. Emissions from electricity generation depend on the type and size of the boiler. If most of the boilers are expected to be the same type and size, the appropriate emission factor can be determined easily. If this is not the case, estimate future weighted emission factors reflecting the mix of boiler type and size, based on data from the references given previously.
- The sulfur or ash content, if applicable.
- For point sources, the equivalent control efficiency required by future emission regulations, including NSPS.

Enter future county emissions in Table 7.2.

(5) Incineration

1. Use the manufacturing sector growth factor from the OBERS projections as the industrial growth factor. Use the commercial/institutional sector growth factor from the OBERS projections for growth in commercial/institutional solid waste. Use the population growth factor for growth in residential and government solid waste. Enter these factors in Table 5.2.

2. Multiply baseline solid waste by these growth factors, and apportion to disposal methods given in Table 5.2 based on any available data concerning future disposal methods.

3. To compute future emissions, multiply projected solid waste for each disposal method by emission factors for the projection years, and for point sources by the equivalent control efficiency required in the projection

year by emission standards. When computing emission factors, include all local knowledge and data about proposed regulations concerning incineration and open burning. Enter projected emissions in Table 7.2.

(6) Miscellaneous Area Sources

1. Evaporation

(1) Gasoline

Determine future gasoline sales in the county from one or more of the following sources:

- County or state energy office
- County or state tax agency
- Transportation studies
- Gasoline dealers association surveys.

In addition, future county gasoline sales may have been computed in Section 3 of this Chapter. If none of the above sources contains the necessary information, use total projected gasoline vehicle miles from Section 4 and divide by 12.2 miles per gallon to produce gasoline use. Enter projected gasoline sales in columns 2-4, Table 6.1. Multiply by the emission factor for gasoline evaporation and enter projected emissions in Table 7.2 under the transportation (area) source category.

(2) Solvents

Scale baseline solvent use by the population growth factor for the projection years, and enter in columns 2-4, Table 6.1. Multiply by the emission factor for solvent use and enter projected emissions in Table 7.2, in the solvent evaporation category under miscellaneous (area) sources.

2. Other Miscellaneous Sources

Projecting emissions for these miscellaneous sources is not included specifically in Chapter IV because procedures for estimating emissions from these sources which were not regarded as significant in the past are in the process of being modified and improved. The miscellaneous area source categories given in the attached tables have been expanded from the categories given in the NEDS NER format, and reflect the increasing importance associated with these sources. Space for recording the calculations of miscellaneous emissions is provided in Table 6.2.

LEVEL 2 EMISSION PROJECTIONS

In addition to the data required for the Level 1 projections, more specific county data on projected growth patterns is needed at this level, including land-use plans, air quality control plans, transportation plans and so on. Projecting future point source emissions involves not only projecting changes in activity levels, but also includes the effect of emission control regulations to be implemented in the future. The procedure recommended for including future controls in the projections, given in Chapter I starting on page 17, involves calculating the equivalent removal efficiency based on externally uncontrolled emissions. In addition, point source emissions projections should include four other considerations:

- Early compliance to new source performance standards
- Variance from emission regulations
- Replacement of operating equipment due to obsolescence
- Increase in plant output with no change in plant output capacity.

(1) Industrial Process

The most accurate method for projecting industrial process emissions involves forecasting on an individual point source basis rather than on an aggregated source basis. This is because source specific data on base year emission control and operating capacity is needed to determine the equivalent source activity level and projected net emissions in the future as affected by future control requirements. Consequently, Level 3 projection is recommended for industrial process emissions because that method does consider individual sources. Substantially less confidence should be placed in Level 1 and Level 2 projections, in which sources are treated at an aggregated level.

- For each projection year, determine a growth factor for each SCC process for which substantial emissions are produced in the county. Review applicable state or county projection data, as found in:

  - Land-use plans
  - Industrial growth studies
  - Zoning data.

  These data may be of a qualitative nature but should be translated into numeric terms for use in the projections. Enter in column 3, Table 1.4. One Table 1.4 must be completed for each projection year.

- From applicable local control regulations or the Control Factor Mobile Source document, estimate equivalent control efficiency required for each pollutant, relative to the baseline year, for each SCC process, for each projection year. To do this a weighted control factor reflecting both the control required for each process within a process category and the future process throughput mix in the county must be computed.* Enter in columns 5-9, Table 1.4.

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* The weighted control factor CFW_{jp} for process category (j) and pollutant (p) is given by:

$$CFW_{jp} = \frac{\sum_i O_i \, ECF_{pi}}{\sum_i O_i}$$

where:

i = specific SCC process within process category (j)

O_i = future throughput for process (i)

ECF_i = equivalent control efficiency required in the projection year for pollutant (p) and process (i)

- Scale the baseline emissions (columns 9-13, Table 1.3) by the process category growth factor and SCC control factors to produce future emissions. Add emissions for all processes in each NER category to give NER process category totals, and enter the results in Table 7.2.

(2) Fuel Combustion

Fuel combustion emissions are projected by first determining the future fuel energy demand (in Btus) and then apportioning that demand to the fuels which are likely to be used.

1. Convert the county baseline fuel use to Btu equivalents and enter in Table 2.6. To do this it is necessary to add up the Btus for both point and area source combustion of each fuel. Since the Btu content of fuels shows substantial variation regionally, use the Btu equivalent which is appropriate for the region in question. Then compute the projected Btu demand as follows:

   - Residential. Determine the projected increase in dwelling units in the county, based on zoning plans, construction or real estate development plans, land-use plans and housing studies. Use this data to produce growth factors for the projection years.
   - Industrial. Consult the same sources as above, and also industrial growth plans or fuel studies to determine an appropriate industrial growth factor.
   - Commercial/Institutional. Use the same sources as above to calculate commercial/institutional growth factor.

The expected effect of energy conservation practices should be considered when computing these growth factors. Enter the growth factors in Table 2.7. Project future Btu demand using these growth factors and the base year Btu demand (in Table 2.6), and enter in Table 2.7.

2. Predict the future fuel mix for the county based on local knowledge and data concerning historical fuel use trends and future fuel availability. In the absence of any such data, use the same fuel mix as in the baseline year.

One method for estimating the future fuel mix is to distribute the projected Btu demand to various fuels directly (such as a percentage for natural gas, a percentage for distillate oil, etc.). There is another method which, based on the available projection data, may be easier to implement. The latter method involves:

- First distributing only the net increase in the Btu demand to the fuels expected to be used to meet that demand
- Determining the net effect of conversion of existing combustion equipment to burn other fuels
- Using this data to make the fuel distribution of the projected Btu demand.

The use of electricity, while producing no emissions at the point of consumption, must be considered when distributing the projected Btu demand to various fuels. Only the electricity used as a substitute for fuel combustion should be considered, however. This type of consumption includes primarily space heating and cooling, and does not include the use of electric appliances or industrial machinery. Determine the amount of electricity projected for space heat in the state (or in the county, if those data are available) by each customer category (residential, industrial, commercial/institutional). The best source of this data is the Regional Electric Reliability Council. Enter future county fuel use in Table 2.8; one Table 2.8 must be completed for each projection year.

3. Enter the projected sulfur and ash content in Table 2.2, based on allowable maximum or baseline content, whichever is smaller.

4. Convert the future fuel use data to emissions by multiplying by:

- The emission factor from AP-42 or the NEDS emission factor file. Emissions from fuel combustion depend on the type and size of the boiler. If most of the boilers are expected to be the same type and size, the appropriate emission factor can be determined easily. If this is not the case, estimate future weighted emission factors reflecting the mix of boiler type and size, based on data from distributors, servicemen or state registrations.

- The sulfur or ash content, if applicable.

- For point sources, the equivalent control efficiency required by future emission regulations including NSPS.

5. Enter future emissions in Table 7.2.

(3) Transportation

1. Highway Vehicles

Procedures used to estimate emissions from highway vehicles have in the past considered three major vehicle classifications:

- Light-duty gasoline
- Heavy-duty gasoline
- Heavy-duty diesel.

These correspond identically to the vehicle categories given in the NER. Emission factors for these categories are given in AP-42. Highway vehicle categories have recently been expanded by EPA to include the following:

- Light-duty vehicles (LDV)
- Light-duty trucks (LDT)

- Heavy-duty gasoline vehicles (HDV)
- Heavy-duty diesel vehicles (HDD)
- Motorcycles (MC).

Emission factors for these categories are given in the Control Factor/Mobile Source document referenced in Chapter II. The five category classification is recommended for projecting emissions because of the increased accuracy resulting from the more detailed vehicle classification. To be entered in the projection NER, emissions from the new five vehicle classification should be aggregated into the three vehicle NER classification as follows:

NER Category	Vehicle Type
Light-duty gasoline	Light-duty vehicles Light-duty trucks Motorcycles
Heavy-duty gasoline	Heavy-duty gasoline vehicles
Heavy-duty diesel	Heavy-duty diesel vehicles

If baseline VMT for highway vehicles was computed only for the three vehicle category classification, that data must first be disaggregated to the five category classification. Consult state or county transportation or highway data.

To project emissions:

(1) Determine county estimates for future VMT in projection years for each of the five vehicle types from county transportation or highway studies. If these data are not available, use the estimated increase in state VMT by vehicle type, and apportion the results to obtain the county share by using one of the following approaches:[1]

- The baseline share
- Vehicle registrations (county/state)
- Miles of highway (county/state).

or some combination of the above. Based on county baseline VMT, compute growth factors for the projection years and enter the results in Table 3.4. One Table 3.4 must be completed for each projection year.

(2) The age distribution of county vehicles and the annual mileage driven by the vehicles of each age group (in years) must be considered to produce weighted emission factors for HC (exh), CO and NO_x for LDV. The equation for the weighted emission factor e_{np} for calendar year (n) and pollutant (p) is:

$$e_{np} = \frac{\sum_i (c_i \times d_i \times f_i \times t_i)}{\sum_i f_i t_i}$$

where:

i = age of vehicle

c_i = the federal test emission factor for the model year corresponding to vehicle age (i) at low mileage

d_i = the controlled pollutant (p) emission deterioration factor for model year (i) at calendar year n

f_i = fraction of total vehicles in use of age (i)

t_i = average annual miles driven by vehicle of age (i)

Note that this equation is equivalent to the one given in AP-42 but is expressed in a slightly different form because in the above equation:

- The speed adjustment is assumed independent of vehicle age

- The expanded form of the weighted annual travel term (m_i in AP-42) is given.

A detailed discussion of this method, as well as test emission factors and nationwide data which can be used for f_i and t_i (if no local data are available) can be found in AP-42 and the Control Factor/Mobile Source document. Calculation of weighted emission factors using the above equation may be facilitated by using Table 3.2 as a step-by-step work sheet. Instructions for completing Table 3.2 are given starting on page 84. Enter these weighted emission factors in Table 3.4. Enter emission factors for HC (evap), SO_x and particulates from the same documents in Table 3.4.

(3) If emissions in the county from other gasoline vehicles (LDT, HDV or MC) are sufficient to justify including the effects of speed correction, vehicle age and model year distribution, proceed in the manner used for light-duty vehicles and enter the data in Table 3.4.

(4) Enter the base year county speed correction factors into Table 3.4, or else estimate speed correction factors as given on page 113. Adjust these as required for estimated changes in average road speed (e.g., construction of many limited access highways).

(5) For projected HC (exh), CO and NO_x emissions for LDV, scale the baseline VMT (Table 3.4) by the growth factor (g), weighted emission factors (e) and speed correction factors (s) (e.g., VMT · g · e · s). For projected HC (evap), SO_x and particulate emissions for LDV and for all projected emissions for the other vehicle categories, scale the baseline VMT for all vehicles by the growth factors and emission factors. Add HC (exh) and HC (evap) emissions to produce total HC emissions,

aggregate projected emissions into the NER vehicle format, and enter in Table 7.2.

2. Off-Highway Vehicles

(1) Compute a growth factor for the change in the number of diesel and gasoline tractors in use. Future farming activity can be based on future acres cultivated and average number of tractors per acre. Consult land-use plans and local agricultural agencies, and interview farm machinery dealers to obtain estimates of the future demand for farm machinery. Also consult county or state fuel use projections, if applicable. Enter the resulting growth factors on lines 1 and 3, Table 3.1.

(2) Compute a growth factor for non-building construction employees. Consult the construction industry or use the growth in earnings projected by OBERS for the construction sector in the AQCR. Enter the results on line 4, Table 3.1.

(3) Determine growth factors for any other off-highway sources and enter in Table 3.1.

(4) Multiply the baseline fuel use by these growth factors and enter in the appropriate columns of Table 4.1. Scale the projected fuel use by the emission factors from AP-42, and add total projected emissions for off-highway gasoline and diesel use. Enter projected emissions in Table 7.2.

3. Rail

Determine growth factors for diesel locomotive use based on projections for increases in rail traffic; consult transportation studies or contact the railroads directly.

Enter the growth factors on line 6, Table 3.1. Scale baseline fuel use by the growth factors and emissions factors from AP-42, and enter projected emissions in Table 7.2.

4. Vessels

Compute emissions resulting from vessel traffic as follows:

(1) Commercial Vessels Consuming Coal and Oil

Determine the appropriate growth factor for vessel movement based on:

- Interviews with shippers and port authority officials to determine estimated increase in vessel traffic within county boundaries
- Consulting county or state transportation studies
- Projections of national vessel traffic from the U.S. Department of Transportation which can be disaggregated to the county level by base year tonnage ratios (county shipping tonnage/nation shipping tonnage).

Enter on lines 7-9, Table 3.1. Scale baseline fuel use by these growth factors and emission factors from AP-42, and enter projected emissions in Table 7.2.

(2) Recreational Vessels Consuming Gasoline

Enter population growth factors on line 10, Table 3.1. Scale baseline fuel use by these growth factors and the emission factors from AP-42, and enter projected emissions in Table 7.2.

5. Aircraft

First consult the following sources of data:

- Transportation studies and individual airport studies
- State air traffic projection data from FAA (obtain projected county share by using present share)
- National air traffic forecasts from FAA, if none of the above sources have the required data.

For each projection year, determine two growth factors reflecting the expected change in overall air traffic for:

- Civil and commercial aircraft
- Military aircraft.

Scale baseline LTO cycles for civil and commercial aircraft by the first growth factor, and military aircraft by the second growth factor. This assumes the aircraft mix in the two general categories will remain static. Enter the growth factors in columns 2, 4 and 6, Table 3.5 ; scale the baseline LTO cycles for aircraft type by the appropriate growth factor for each projection year, and enter the results in columns 3, 5 and 7, Table 3.5 . Project emissions by multiplying projected activity (LTO cycles) by the emission factors from AP-42. Aggregate emissions for these aircraft types into NER categories (commercial, civil and military) and enter in Table 7.2.

(4) Electric Generation

The forecasts made in this section will be based on available data on new power plant sites and anticipated fuel type. Such data is available for the near-term (less than 10 years) but is more speculative for the long-term. Because emissions will increase abruptly when a new fossil fuel plant comes on line, it is essential to determine as precisely as possible the year in which that will occur, even though it may not be one of the three forecast years being considered. Indicate in a footnote to the appropriate forecast table the projected year of start-up for the facility. The procedures to be used in preparing the electric generation emissions forecast are as follows:

1. Determine the amounts of fuels which will be burned (both internal and external combustion) to produce electricity in the projection years, as well as the sulfur and ash content, if applicable, from:

   - County or state utility commission data
   - Regional Electric Reliability Council
   - FPC Form 67

   and enter in columns 3-14, Table 4.1.

2. Convert the future fuel data to emissions by multiplying by:

   - The emission factor from AP-42 or the NEDS emission factor file. Emissions from electricity generation depend on the type and size of the boiler. If most of the boilers are expected to be the same type and size, the appropriate emission factor can be determined easily. If this is not the case, estimate future weighted emission factors reflecting the mix of boiler type and size, based on data from the references given previously.

   - The sulfur or ash content, if applicable.

   - For point sources, the equivalent control efficiency required by future emission regulations including NSPS.

   Enter future county emissions in Table 7.2.

(5) Incineration

1. For each projection year, determine growth factors for each source as given in Table 5.2. Consult county or state solid waste studies and land-use plans.

2. Multiply baseline solid waste by these growth factors, and apportion to disposal methods given in Table 5.2 based on the same data sources.

3. To compute future emissions, multiply projected solid waste by emission factors for the projection years. For point sources also multiply by the equivalent control efficiency required in the projection year to meet emission standards. When computing emission factors include all local knowledge and data about proposed regulations concerning incineration and open burning. Enter projected emissions in Table 7.2.

(6) Miscellaneous Area Sources

1. Evaporation

(1) Gasoline

Determine future gasoline sales in the county from one or more of the following sources:

- County or state energy office
- County or state tax agency
- Transportation studies
- Gasoline dealers association surveys.

In addition, future county gasoline sales may have been computed in Section 3 (Transportation) of this chapter. If none of the above sources contains the necessary information, use total projected gasoline vehicle miles from Section 3 and divide by 12.2 miles per gallon to produce gasoline use. Enter projected gasoline sales in columns 2-4, Table 6.1. Multiply by the emission factor for gasoline evaporation and enter projected emissions in Table 7.2, under the transportation (area) source category.

(2) Solvents

Scale baseline solvent use by the population growth factor for the projection years, and enter in columns 2-4, Table 6.1. Multiply by the emission factor for solvent use and enter projected emissions in Table 7.2, in the solvent evaporation category under miscellaneous (area) sources.

2. Other Miscellaneous Sources

Projecting emissions for these miscellaneous sources is not included specifically in Chapter IV because procedures for estimating emissions from these sources which were not regarded as significant in the past are in the process of being modified and improved. The miscellaneous area source categories given in Table 7.2 have been expanded from the categories given in the NEDS NER format, and reflect the increasing importance associated with those sources. Space for recording the calculations of miscellaneous emissions is provided in Table 6.2.

LEVEL 3 EMISSION PROJECTIONS

The additional data required to complete the Level 3 projections is to be obtained through interviews with industrial and commercial organizations to determine their plans for facilities expansion. Projecting future point source emissions involves not only projecting changes in activity levels, but also includes the effect of emission control regulations to be implemented in the future. The procedure recommended for including future controls in the projections, given in Chapter I starting on page 17, involves calculating the equivalent removal efficiency based on externally uncontrolled emissions. In addition, point source emission projections should include four other considerations:

- Early compliance to new source performance standards
- Variance from emission regulations
- Replacement of operating equipment due to obsolescence
- Increase in plant output with no change in plant output capacity (i.e., a change in utilization of existing capacity).

(1) Industrial Process Emissions

In these calculations consider only those categories of the 13 NER process categories which account for substantial emissions in the county.

- From the data gathered during the industrial interview program, initiated for baseline data update, determine a growth factor for each projection year for each SCC process and enter in Table 1.4. One Table 1.4 must be completed for each projection year.
- From data on applicable control regulations or NSPS, and aided by the industrial interview program, determine the equivalent control efficiency required for each pollutant, for each SCC process, for each projection year. Enter the results in Table 1.4.
- From the interview program, determine expected total throughput for each point source SCC process

from all plants in each projection year, and enter in column 4, Table 1.4. For each individual point source, compute projected emissions based on projected throughput, emission factors from AP-42, and the future required emission control from the Control Factor/Mobile Source document. (Detailed instructions are given on page 17.) Aggregate emissions for all processes in each NER category to give NER process category totals, and enter in Table 7.2.

- If projected throughput data cannot be determined from interviews, emissions for each individual point source may be projected based on net emissions and emission control in the base year, the growth factor for the SCC, the emission factor from AP-42, and the future required emission control from the Control Factor/Mobile Source document. (Detailed instructions are given on page 17.) Aggregate emissions for all processes in each NER category to give NER process category totals, and enter in Table 7.2.

(2) Fuel Combustion

Fuel combustion emissions are projected by first determining the future fuel energy demand (in Btus) and then apportioning that demand to the fuels which are likely to be used.

1. Convert the county baseline fuel use to Btu equivalents and enter in Table 2.6. To do this it is necessary to add up the Btus for both point and area source combustion of each fuel. Since the Btu content of fuels shows substantial variation regionally, use the Btu equivalent which is appropriate for the region in question. Then compute the projected Btu demand as follows:

   - Residential. Determine the projected increase in dwelling units in the county, based on zoning plans, land-use plans and housing studies. Use this data to produce growth factors for the projection years. Adjust the growth factors to reflect any change in the average number of rooms per dwelling unit, based on expected new construction. This could be determined by the type of proposed dwelling unit: home, townhouse, apartment, etc.

- **Industrial.** Use the results of the interview program with the major industrial fuel users in the county conducted to obtain data for the baseline year and with any industries which are considered likely to be major polluters in the projection years. The latter can be identified from county industrial growth plans, or from interviews with the present major polluters. Minimum data requirements are specified in Exhibit 1 in the Appendix.

- **Commercial/Institutional.** Obtain growth factors from this sector by conducting an interview program with the major commercial fuel users similar to the industrial interview program above. Minimum data requirements are specified in Exhibit 2 in the Appendix.

The expected effect of energy conservation practices should be considered when computing these growth factors.

2. Enter the growth factors calculated in this manner in Table 2.7; use them to scale baseline county Btu demand for the projection years. Enter the projected Btu demand in Table 2.7. The interview programs should produce an indication of the potential shift among fuels, which can be used to adjust the future fuel mix, and the future sulfur and ash content.

One method for estimating the future fuel mix is to distribute the projected Btu demand to various fuels directly (such as a percentage for natural gas, a percentage for distillate oil, etc.). There is another method which, based on the available projection data, may be easier to implement. The latter method involves:

- First distributing only the net increase in the Btu demand to the fuels expected to be used to meet the demand

- Determining the net effect of conversion of existing combustion equipment to burn other fuels

- Using this data to make the fuel distribution of the projected Btu demand.

The use of electricity, while producing no emissions at the point of consumption, must be considered when distributing the projected Btu demand to various fuels. Only the electricity used as a substitute for fuel combustion should be considered, however. This type of consumption includes primarily space heating and cooling, and does not include the use of electric appliances or industrial machinery. Determine the amount of electricity projected for space heat in the state (or in the county, if those data are available) by each customer category (residential, industrial, commercial/institutional). The best source of this data is the Regional Electric Reliability Council. Enter future county fuel use in Table 2.8; enter projected sulfur/ash content in Table 2.2. One Table 2.8 must be completed for each projection year.

3. Convert the future fuel use data to emissions by multiplying by:

- The emission factor from AP-42 or the NEDS emission factor file. Emissions from fuel combustion depend on the type and size of the boiler. If most of the boilers are expected to be the same type and size, the appropriate emission factor can be determined easily. If this is not the case, fuel consumption for each source should be multiplied by the emission factor for that source; the emissions should be aggregated to totals for each fuel.

- The sulfur or ash content, if applicable.

- For point sources, the equivalent control efficiency required by future emission regulations including NSPS.

4. Enter future emissions in Table 7.2.

(3) Transportation

1. Highway Vehicles

Procedures used to estimate emissions from highway vehicles have in the past considered three major vehicle classifications:

- Light-duty gasoline
- Heavy-duty gasoline
- Heavy-duty diesel.

These correspond identically to the vehicle categories given in the NER. Emission factors for these categories are given in AP-42. Highway vehicle categories have recently been expanded by EPA to include the following:

- Light-duty vehicles (LDV)
- Light-duty trucks (LDT)
- Heavy-duty gasoline vehicles (HVD)
- Heavy-duty diesel vehicles (HDD)
- Motorcycles (MC).

Emission factors for these categories are given in the Control Factor/Mobile Source document referenced in Chapter II. The five category classification is recommended for projecting emissions because of the increased accuracy resulting from the more detailed vehicle classification. To be entered in Table 7.2, emissions from the new five vehicle classification should be aggregated into the three vehicle NER classification as follows:

NER Category	Vehicle Type
Light-duty gasoline	Light-duty vehicles Light-duty trucks Motorcycles
Heavy-duty gasoline	Heavy-duty gasoline vehicles
Heavy-duty diesel	Heavy-duty diesel vehicles

If baseline VMT for highway vehicles was computed only for the three vehicle category classification, that data must first be disaggregated to the five category classification. Consult state or county transportation or highway data.

To project emissions:

(1) Obtain estimates for future county VMT for each of the five vehicle types from county transportation or highway studies. Determine this data for each projection year. Consult Chapter 5 of APTD-1135 for a complete discussion of this method.

(2) The age distribution of county LDV and the annual mileage driven by the vehicles of each age group must be considered to produce weighted emission factors for HC (exh), CO and NO_x for LDV. The equation for the weighted emission factor e_{np} for calendar year (n) and pollutant (p) is

$$e_{np} = \frac{\sum_i (c_i \times d_i \times f_i \times t_i)}{\sum f_i t_i}$$

where:

i = age of vehicle

c_i = the federal test emission factor for the model year corresponding to vehicle age (i) at low mileage

d_i = the controlled pollutant (p) emission deterioration factor for model year (i) at calendar year n

f_i = fraction of total vehicles in use of age (i)

t_i = average annual miles driven by vehicle of age (i)

Note that this equation is equivalent to the one given in AP-42 but is expressed in a slightly different form because in the above equation:

- The speed adjustment is assumed independent of vehicle age
- The expanded form of the weighted annual travel term (m_i in AP-42) is given.

A detailed discussion of this method, as well as test emission factors and nationwide data which can be used for f_i and t_i (if no local data are available) can be found in AP-42 and the Control Factor/Mobile Source document. Calculation of weighted emission factors using the above equation may be facilitated by using Table 3.2 as a step by step work sheet. The average route speed of LDV must also be considered in the emission projections by completing Table 3.3. Instructions for completing Table 3.2 and Table 3.3 are given starting on page 84. Enter these weighted emission factors and speed correction factors in Table 3.4. Enter emission factors for HC (evap), SO_x and particulates from the same sources in Table 3.4.

(3) If emissions in the county from other gasoline vehicles (LDT, HDV or MC) are sufficient to justify including the effect of speed correction, vehicle age and model year distribution, proceed in the manner used for LDV and enter the data in Table 3.4.

(4) Otherwise, to project HC (exh), CO and NO_x emissions for LDV, scale the baseline VMT for LDV (Table 3.4) by the growth factors (g), weighted emission factors (e) and speed correction factors (s) (e.g., $VMT \cdot g \cdot e \cdot s$). For projected HC (evap), SO_x and particulate emissions, for LDV, and for all projected emissions for the other vehicle categories, scale the baseline VMT for all vehicles by the growth factors and emission factors. Add HC (exh) and HC (evap) emissions to produce total HC emissions. Aggregate projected emissions into the NER vehicle format and enter in Table 7.2.

2. Off-Highway Vehicles

(1) Compute a growth factor for the change in the number of diesel and gasoline tractors in use. Future farming activity can be based on future acres cultivated and average number of tractors per acre. Consult land-use plans and local agricultural agencies and interview farm machinery dealers to obtain estimates of the future demand for farm machinery. Also consult county or state fuel use projections, if applicable. Enter the resulting growth factors on lines 1 and 3, Table 3.1.

(2) Compute a growth factor for non-building construction employees. Consult the construction industry or use the growth in earnings projected by OBERS for the construction sector in the AQCR or SMSA. Enter the results on line 4, Table 3.1.

(3) Determine growth factors for any other off-highway sources and enter in Table 3. 1.

(4) Multiply the baseline fuel use by these growth factors and enter in the appropriate columns of Table 3. 1. Scale the projected fuel use by the emission factors from AP-42 and add total projected emissions for off-highway gasoline and diesel use. Enter projected emissions in Table 7. 2.

3. Rail

Determine growth factors for diesel locomotive use based on projections for increases in rail traffic; consult transportation studies or contact the railroads directly. Enter the growth factors on line 6, Table 3. 1. Multiply baseline fuel use by the growth factors and emission factors from AP-42, and enter projected emissions in Table 7. 2

4. Vessels

Compute emissions resulting from vessel traffic as follows:

(1) Commercial Vessels Consuming Coal and Oil

Determine the appropriate growth factor for vessel movements based on:

- Interviews with shippers and port authority officials to determine estimated increase in vessel traffic within county boundaries
- Consulting county or state transportation studies
- Projections of national vessel traffic from the U. S. Department of Transportation

which can be disaggregated to the county level by base year tonnage ratios (county shipping tonnage/nation shipping tonnage).

Enter on lines 7-9, Table 3.1. Scale baseline fuel use by these growth factors and emission factors from AP-42 and enter projected emissions in Table 7.2.

(2) Recreational Vessels Consuming Gasoline

Enter population growth factors on line 10, Table 3.1. Multiply baseline fuel use by these growth factors and the appropriate emission factors from AP-42, and enter projected emissions in Table 7.2.

5. Aircraft

Consult the following sources to estimate growth in air traffic:

- Transportation studies or individual airport studies
- Contact all airports
- State air traffic projection data from FAA scaled to obtain county share by using the present share.

For each projection year, determine a growth factor representing the change in the number of LTO cycles for each aircraft type (not overall air traffic).

Enter growth factors for each aircraft type in Table 3.5. For each aircraft type, scale baseline LTO cycles by the growth factors and emission factors from AP-42. Add to total aircraft emissions for each of the three NER categories (commercial, civil and military), and enter in Table 7.2.

(4) Electric Generation

The forecasts made in this section will be based on available data on new power plant sites and anticipated fuel type. Such data is available for the near-term (less than 10 years) but is more speculative for the long-term. Interviews with the power utilities in the county, as recommended below, are the best source of such data. Because emissions will increase abruptly when a new fossil fuel plant comes on line, it is essential to determine as precisely as possible the year in which that will occur, even though it may not be one of the three forecast years being considered. Indicate in a footnote to the appropriate forecast Table the projected year of start-up for the facility. The procedures to be used in preparing the electric generation emissions forecast are as follows:

1. Estimate the amounts of each fuel which will be burned (both internal and external combustion) to produce electricity in the projection years, and determine the sulfur and ash content of this fuel, if applicable, by interviewing the power companies in the county and consulting other references such as FPC Form 67 submissions (filed with local agencies or the FPC). Enter the results in columns 3-14, Table 4. 1.

2. Convert the future fuel use data to emissions by multiplying by:

   - The emission factor from AP-42 or the NEDS emission factor file. Emissions from electricity generation depend on the type and size of the boiler. If most of the boilers are expected to be the same type and size, the appropriate emission factor can be determined easily. If this is not the case, fuel consumption for each source should be multiplied by the emission factor for that source; the emissions should be aggregated to totals for each fuel.

   - The sulfur or ash content, if applicable.

- For point sources, the equivalent control efficiency required by future emission regulations including NSPS.

Enter future county emissions in Table 7.2.

(5) Incineration

1. For each projection year, determine growth factors for each source and each disposal method given in Table 5.2. The best source of this information is direct contact with agencies and organizations responsible for the large point sources. In addition, consult county or state solid waste studies and land-use plans for data concerning expected changes in solid waste levels and disposal methods, and for residential (area source) data.

2. Multiply baseline solid waste by these growth factors, and apportion to disposal methods given in Table 5.2 based on the same data sources.

3. To compute future emissions, multiply projected solid waste by emission factors for the projection years. For point sources, also multiply by the equivalent control efficiency required in the projection year to meet emission standards. When computing emission factors include all local knowledge and data about proposed regulations concerning incineration and open burning. Enter projected emissions in Table 7.2.

(6) Miscellaneous Area Sources

1. Evaporation

(1) Gasoline

Determine future gasoline sales in the county from one or more of the following sources:

- County or state energy office
- County or state tax agency
- Transportation studies
- Gasoline dealers association surveys.

In addition, future county gasoline sales may have been computed in Section 3 (Transportation) of this chapter. If none of the above sources contain the necessary information, use total projected gasoline vehicle miles from Section 3 and divide by 12.2 miles per gallon to produce gasoline use. Enter projected gasoline sales in Table 6.1. Multiply by the emission factor for gasoline evaporation and enter projected emissions in Table 7.2, under the transportation (area) source category.

(2) Solvents

Scale baseline solvent use by the population growth factor for the projection years, and enter in Table 6.1. Multiply by the emission factor for solvent use and enter projected emissions in Table 7.2, in the solvent evaporation category under miscellaneous (area) sources.

2. Other Miscellaneous Sources

Projecting emissions for these miscellaneous sources is not included specifically in Chapter IV because procedures for estimating emissions from these sources which were not regarded as significant in the past are in the process of being modified and improved. The miscellaneous area source categories given in Table 7.2 have been expanded from the categories given in the NEDS NER format, and reflect the increasing importance associated with these sources. Space for recording the calculations of miscellaneous emissions is provided in Table 6.2.

APPENDIX

FIGURES AND TABLES*

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* All activity levels are per calendar year; all emission totals are tons per calendar year.

EXHIBIT 1
Data Requirements for
Industry Interviews

Note: All activity levels per calendar year

1. Fuel Use
    (1) Type (base year and projection years)
    (2) Amount (base year and projection years)
    (3) Point or area source (base year and projection years)
    (4) Sulfur/ash content (base year and projection years)
    (5) Expected shifts in present fuel use patterns
    (6) Rate of replacement for obsolete equipment
    (7) Is fuel use proportional to plant throughput?
    (8) Present emission regulations and compliance with those regulations

2. Industrial Processes
    (1) Annual throughput for base year and projection years for each SCC process
    (2) Expected process shifts
    (3) Rate of replacement for obsolete equipment
    (4) Present operating capacity and any expected change
    (5) Present emissions regulations and compliance with those regulations

3. Incineration
    (1) Methods and amounts (base year and projection years)
    (2) Point or area source (base year and projection years)
    (3) Is incineration proportional to plant throughput?
    (4) Present emission regulations and compliance with those regulations

EXHIBIT 2

Data Requirements for Commercial/ Institutional Interviews

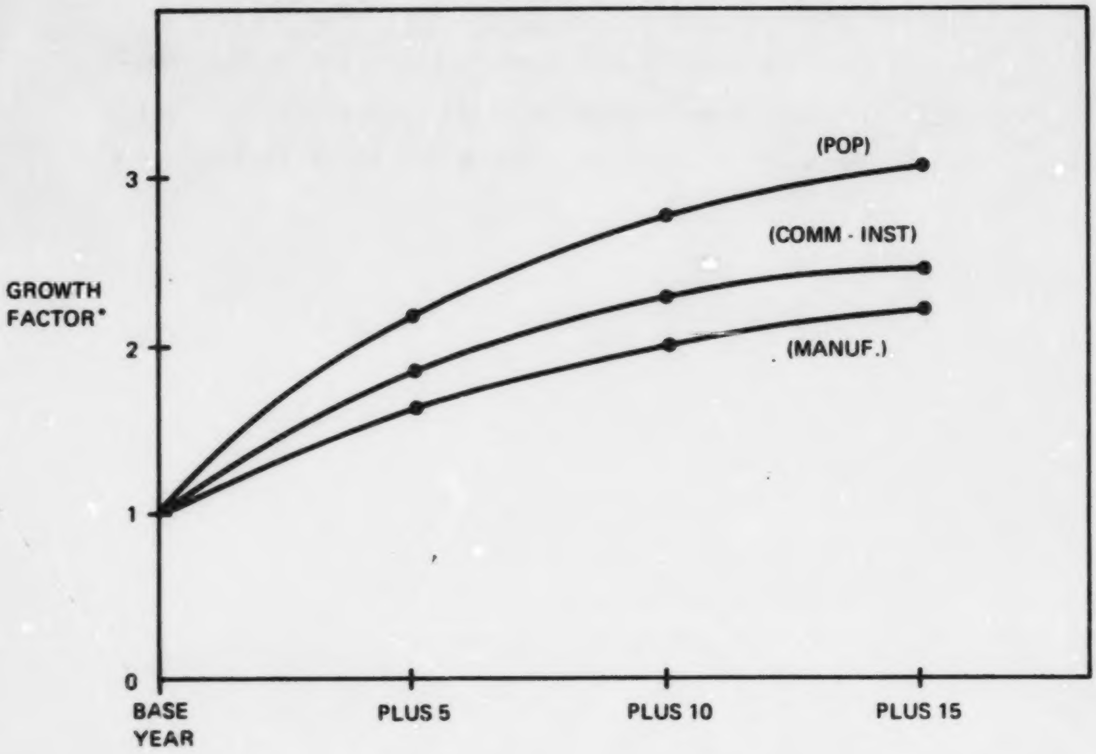
Note: All activity levels per calendar year

1. Fuel Use
   (1) Type (base year and projection years)
   (2) Amount (base year and projection years)
   (3) Point or area source (base year and projection years)
   (4) Sulfur/ash content (base year and projection years)
   (5) Expected shifts in present fuel use patterns
   (6) Rate of replacement for obsolete equipment
   (7) Present emission regulations and compliance to those regulations

2. Incineration
   (1) Methods and amounts (base year and projection years)
   (2) Point or area source (base year and projection years)
   (3) Present emission regulations and compliance to those regulations

EXHIBIT 3
Schematic of Growth Factors

YEAR	PROJECTED POPULATION	PROJECTED EARNINGS, MANUF.	PROJECTED EARNINGS, COMM - INST.
BASE			
PLUS 5			
PLUS 10			
PLUS 15			



* (PROJECTED POPULATION OR EARNINGS)/(BASE YEAR POPULATION OR EARNINGS)

Table 1. 1
Baseline Emissions, Growth Factors and Controls

NEDS PROCESS CATEGORY	NEDS DATA YR ______					f	BASELINE YR ______					GROWTH FACTOR	CONTROLS (1-EQUIVALENT CONTROL EFFICIENCY)				
	PART	SOX	NOX	HC	CO		PART	SOX	NOX	HC	CO		PART	SOX	NOX	HC	CO
COLUMN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CHEMICAL MANUFACTURING																	
FOOD/AGRICULTURE																	
PRIMARY METALS																	
SECONDARY METALS																	
MINERAL PRODUCTS																	
PETROLEUM																	
WOOD PRODUCTS																	
EVAPORATION																	
METAL FABRICATION																	
LEATHER																	
TEXTILE																	
INPROCESS FUEL																	
OTHER																	

BASELINE CALCULATION LEVEL ______ , METHOD ______
PROJECTION CALCULATION LEVEL ___ , METHOD ______
DATA SOURCES: ____________________

PROJECTION YEAR ______

Table 1.2
Correction Factor for Plants Not Interviewed

LINE	DATA ELEMENT	EMISSIONS, TONS				
		PART	SOX	NOX	HC	CO
1	TOTAL PROCESS EMISSIONS FROM PLANTS WHICH WERE INTERVIEWED (FROM COUNTY NER)					
2	TOTAL PROCESS EMISSIONS FROM COUNTY NER					
3	CORRECTION FACTOR (LINE 2÷ LINE 1)					

CALCULATION LEVEL ________, METHOD: ______

DATA SOURCES ______________________________

Table 1.3
Baseline Emissions

COLUMN 1	2		3	4	5	6	7	8	9	10	11	12	13
	SCC PROCESS		NEDS YR ______						BASELINE YR ______				
PROCESS CATEGORY	NAME	SCC CODE	PART	SOX	NOX	HC	CO	f	PART	SOX	NOX	HC	CO
(Chemical Manufacturing)	▨ SAMPLE	▨											
	(adipic acid, general cyclohex)	3-01-001-01											
	▨	▨											

CALCULATION LEVEL ______ , METHOD ______
DATA SOURCES ______

Table 1.4
Projection Growth Factors and Controls

COLUMN 1	2		3	4	5	6	7	8	9
	SCC PROCESS		GROWTH FACTOR	PROJECTED THROUGHPUT	CONTROLS (1 - EQUIVALENT CONTROL EFFICIENCY)				
PROCESS CATEGORY	NAME	SCC CODE			PART	SOX	NOX	HC	CO
(Chemical Manufacturing)	▨	▨							
	(adipic acid, general cyclohex)	3-01-001-01							
	▨	▨							

SAMPLE

CALCULATION LEVEL ________ , METHOD ______ PROJECTION YEAR ________
DATA SOURCES ________________

Table 2.1
Baseline County Fuel Use
(External Combustion Unless Noted Otherwise)

		MAJOR FUELS								MINOR FUELS										ELECTRICITY
		COAL			OIL															
SOURCE		ANTHRACITE	BITUMINOUS	LIGNITE	RESIDUAL	DISTILLATE	DISTILLATE (INTERNAL)*	NATURAL GAS	NATURAL GAS (INTERNAL)*	PROCESS GAS	LPG	COKE	WOOD	BAGASSE	DIESEL (INTERNAL)*	GASOLINE (INTERNAL)*	ENGINE TESTING (INTERNAL)*	OTHER	OTHER (INTERNAL)*	(USED AS FUEL SUBSTITUTE)
INDUSTRIAL	POINT																			
	AREA																			
COMMERCIAL/ INSTITUTIONAL	POINT																			
	AREA																			
RESIDENTIAL	AREA																			
UNITS		TONS			1000 GALLONS			10^6 CU FT			1000 GAL	TONS			1000 GALLONS					KWH

CALCULATION LEVEL ____________

DATA SOURCES ____________

*ALL INTERNAL COMBUSTION REFERS TO STATIONARY SOURCES ONLY

Table 2. 2
Sulfur and Ash Content of Coal and Heating Oil (Projections)

SOURCE	PROJECTION YEAR	PERCENT SULFUR*					PERCENT ASH*		
		ANTHRACITE COAL	BITUMINOUS COAL	LIGNITE COAL	RESIDUAL OIL	DISTILLATE OIL	ANTHRACITE COAL	BITUMINOUS COAL	LIGNITE COAL
INDUSTRIAL	YR:								
	YR:								
	YR:								
COMMERCIAL/ INSTITUTIONAL	YR:								
	YR:								
	YR:								
RESIDENTIAL	YR:								
	YR:								
	YR:								
ELECTRICITY GENERATION	YR:								
	YR:								
	YR:								

CALCULATION LEVEL __________
DATA SOURCES __________

*SULFUR AND ASH CONTENT ARE GIVEN PER UNIT WEIGHT FOR COAL, PER UNIT VOLUME FOR OIL

Table 2.3
Sulfur and Ash Content of Coal and Heating Oil

SOURCE	PERCENT SULFUR*					PERCENT ASH*		
	ANTHRACITE COAL	BITUMINOUS COAL	LIGNITE COAL	RESIDUAL OIL	DISTILLATE OIL	ANTHRACITE COAL	BITUMINOUS COAL	LIGNITE COAL
INDUSTRIAL								
COMMERCIAL/ INSTITUTIONAL								
RESIDENTIAL								
ELECTRICITY GENERATION								

DATA SOURCES: ____________________

BASE YEAR: ____________________

*SULFUR AND ASH CONTENT ARE GIVEN PER UNIT WEIGHT FOR COAL, PER UNIT VOLUME FOR OIL

Table 2. 4
Apportionment of State Heating Oil Sales Totals to Customer Categories

LINE	SALES COMPONENT	FUEL USE, 1000 GAL.	
		RESIDUAL	DISTILLATE
1	TOTAL HEATING OIL SALES		
2	COMM/INST EMPLOYMENT FACTOR		
3	INDUSTRIAL EMPLOYMENT FACTOR		
4	COMM/INST OIL FRACTION		
5	INDUSTRIAL OIL FRACTION		
6	SALES TO MILITARY		
7	SALES TO INDUSTRY		
8	OIL COMPANY USE		
9	RESIDENTIAL USE		
10	TOTAL COMM/INST USE		
11	TOTAL INDUSTRIAL USE		

CALCULATION LEVEL __________

Table 2.5
Baseline State Fuel Use
(External Combustion Unless Noted Otherwise)

		MAJOR FUELS								MINOR FUELS										ELEC-TRIC-ITY
		COAL			OIL															
SOURCE		ANTHRACITE	BITUMINOUS	LIGNITE	RESIDUAL	DISTILLATE	DISTILLATE (INTERNAL)*	NATURAL GAS	NATURAL GAS (INTERNAL)*	PROCESS GAS	LPG	COKE	WOOD	BAGASSE	DIESEL (INTERNAL)*	GASOLINE (INTERNAL)*	ENGINE TESTING (INTERNAL)*	OTHER	OTHER (INTERNAL)*	(USED AS FUEL SUBSTITUTE)
INDUSTRIAL	POINT																			
	AREA																			
COMMERCIAL/ INSTITUTIONAL	POINT																			
	AREA																			
RESIDENTIAL	AREA																			
UNITS		TONS			1000 GALLONS			10^6 CU FT			1000 GAL	TONS			1000 GALLONS					KWH

CALCULATION LEVEL ____________

DATA SOURCES ____________

*ALL INTERNAL COMBUSTION REFERS TO STATIONARY SOURCES ONLY

Table 2.6
Baseline County Fuel Use (Btu Equivalents)
(External Combustion Unless Noted Otherwise)

		MAJOR FUELS								MINOR FUELS										ELECTRICITY	BTU DEMAND
		COAL			OIL																
SOURCE		ANTHRACITE	BITUMINOUS	LIGNITE	RESIDUAL	DISTILLATE	DISTILLATE (INTERNAL)*	NATURAL GAS	NATURAL GAS (INTERNAL)*	PROCESS GAS	LPG	COKE	WOOD	BAGASSE	DIESEL (INTERNAL)*	GASOLINE (INTERNAL)*	ENGINE TESTING (INTERNAL)*	OTHER	OTHER (INTERNAL)*	(USED AS FUEL SUBSTITUTE)	
INDUSTRIAL	POINT																				
	AREA																				
COMMERCIAL/ INSTITUTIONAL	POINT																				
	AREA																				
RESIDENTIAL	AREA																				

CALCULATION LEVEL ____________

DATA SOURCES ____________

*ALL INTERNAL COMBUSTION REFERS TO STATIONARY SOURCES ONLY

Table 2.7
Fuel Combustion Growth Factor
and Projected Btu Demand

SOURCE	GROWTH FACTOR YR____	PROJECTED BTU DEMAND
RESIDENTIAL		
COMMERCIAL/ INSTITUTIONAL		
INDUSTRIAL		

CALCULATION LEVEL ____________

DATA SOURCES ________________

Table 2.8
Projected County Fuel Use
(External Combustion Unless Noted Otherwise)

SOURCE		MAJOR FUELS								MINOR FUELS										ELECTRICITY
		COAL			OIL															
		ANTHRACITE	BITUMINOUS	LIGNITE	RESIDUAL	DISTILLATE	DISTILLATE (INTERNAL)*	NATURAL GAS	NATURAL GAS (INTERNAL)*	PROCESS GAS	LPG	COKE	WOOD	BAGASSE	DIESEL (INTERNAL)*	GASOLINE (INTERNAL)*	ENGINE TESTING (INTERNAL)*	OTHER	OTHER (INTERNAL)*	(USED AS FUEL SUBSTITUTE)
INDUSTRIAL	POINT																			
	AREA																			
COMMERCIAL/ INSTITUTIONAL	POINT																			
	AREA																			
RESIDENTIAL	AREA																			
UNITS		TONS			1000 GALLONS			10^6 CU FT			1000 GAL	TONS			1000 GALLONS					KWH

CALCULATION LEVEL ________________

DATA SOURCES ________________

*ALL INTERNAL COMBUSTION REFERS TO STATIONARY SOURCES ONLY

Table 3.1
Transportation Activity (Off-Highway Vehicles, Rail and Vessels)
Baseline and Projections

SOURCE		FUEL	UNITS	LINE	BASELINE	PROJECTIONS					
					YR ___	YR ___		YR ___		YR ___	
					AMOUNT	GROWTH FACTOR	AMOUNT	GROWTH FACTOR	AMOUNT	GROWTH FACTOR	AMOUNT
OFF-HIGHWAY VEHICLES	TRACTORS	GASOLINE	1000 GAL	1							
	OTHER	GASOLINE	1000 GAL	2							
	TRACTORS	DIESEL	1000 GAL	3							
	CONSTRUCTION	DIESEL	1000 GAL	4							
	OTHER	DIESEL	1000 GAL	5							
RAIL		DIESEL	1000 GAL	6							
VESSELS		DIESEL	1000 GAL	7							
		RESIDUAL OIL	1000 GAL	8							
		COAL	TONS	9							
		GASOLINE	1000 GAL	10							

BASELINE CALCULATION LEVEL ___________

PROJECTION CALCULATION LEVEL ___________

DATA SOURCES ___________

Table 3.2
Weighted Emission Factors for Light-Duty Gasoline Vehicles (Base Year or Projections)

VEHICLE AGE, YEARS (i)		LINE 1		1	2	3	4	5	6	7	8	9	10	11 OR MORE		
VEHICLE MODEL YEAR		2														
FRACTION OF VEHICLES IN USE (f_i)		3													SUM: 1.0	
ANNUAL MILES DRIVEN (t_i)		4														
$f_i t_i$ (line 3 x line 4)		5														SUM FOR LINE 5 ($\Sigma f_i t_i$)
WEIGHTED ANNUAL TRAVEL		6													SUM:1.0	
DETERIORATION FACTOR	HC (EXH)	7														
	CO	8														
	NOX	9														
TEST EMISSION FACTOR	HC (EXH)	10														
	HC (EVAP)	11														
	CO	12														
	NOX	13														
	PART	14														
	SOX	15														
WEIGHTED EMISSION FACTOR	HC (EXH)	16														HC (EXH)
	HC (EVAP)	17														HC (EVAP)
	CO	18														CO
	NOX	19														NOX
	PART	20														PART
	SOX	21														SOX

$\underbrace{\qquad}$ WEIGHTED EMISSION FACTOR

YEAR____________
CALCULATION LEVEL____
DATA SOURCES________

Table 3.3
Baseline Correction Factor for Average Vehicle Speed

AVERAGE SPEED CATEGORY	FRACTION OF VMT AT AVERAGE SPEED	SPEED CORRECTION FACTORS			SPEED CORRECTION FACTOR SCALED BY VMT FRACTION		
		NOX	HC (EXH)	CO	NOX	HC (EXH)	CO
COLUMN 1	2	3	4	5	6	7	8
				TOTAL			

WEIGHTED VEHICLE SPEED CORRECTION FACTORS

YEAR __________

CALCULATION LEVEL __________

DATA SOURCES ________________

Table 3.4
Highway Vehicle Transportation Activity, Baseline and Projections

VEHICLE TYPE AND FUEL		LIGHT DUTY VEHICLES			HEAVY DUTY GASOLINE VEHICLES	HEAVY DUTY DIESEL VEHICLES
		LIGHT DUTY GASOLINE VEHICLES*	LIGHT DUTY TRUCKS	MOTORCYCLES		
	COLUMN	1	2	3	4	5
BASELINE ACTIVITY	YR______ (VMT)					
GROWTH FACTOR (PROJECTION YEAR)	YR______					
SPEED CORRECTION FACTORS	HC (EXH)					▨
	CO					▨
	NOX					▨
WEIGHTED EMISSION FACTORS**	HC (EXH)					
	HC (EVAP)					▨
	CO					
	NOX					
	PART					
	SOX					

BASELINE CALCULATION LEVEL ________________

PROJECTION CALCULATION LEVEL ________________

DATA SOURCES ________________________

*IF THREE VEHICLE CLASSIFICATION IS USED, AND ALL LIGHT DUTY VEHICLES ARE CONSIDERED IN AGGREGATE, USE THIS COLUMN FOR LIGHT DUTY VEHICLE DATA.

**USE LOW MILEAGE TEST EMISSION FACTORS IF ADJUSTMENT FOR VEHICLE AGE, MODEL YEAR AND CONTROL DETERIORATION (TABLE 3.2) ARE NOT MADE.

Table 3.4

Table 3.5
Aircraft Activity, Baseline and Projections

AIRCRAFT	TYPE	BASELINE LTO CYCLES	GROWTH FACTOR	PROJECTED LTO CYCLES	GROWTH FACTOR	PROJECTED LTO CYCLES	GROWTH FACTOR	PROJECTED LTO CYCLES
COLUMN								
YEAR		1	2	3	4	5	6	7
JUMBO JET	COMMERCIAL							
LONG RANGE JET	COMMERCIAL							
MEDIUM RANGE JET	COMMERCIAL							
AIR CARRIER - TURBOPROP	COMMERCIAL							
BUSINESS JET	CIVIL							
GENERAL AVIATION TURBOPROP	CIVIL							
GENERAL AVIATION PISTON	CIVIL							
PISTON TRANSPORT	CIVIL							
HELICOPTER	MILITARY							
MILITARY TURBOPROP	MILITARY							
MILITARY JET	MILITARY							
MILITARY PISTON	MILITARY							

BASELINE CALCULATION LEVEL ______________
PROJECTION CALCULATION LEVEL ______________
DATA SOURCES ______________________

Table 4.1
Electric Generation, Baseline and Projections

FUEL[3]	UNITS	BASELINE YR ______			PROJECTIONS								
					YR ______			YR ______			YR ______		
		AMOUNT	SULF [1]	ASH [2]	AMOUNT	SULF [1]	ASH [2]	AMOUNT	SULF [1]	ASH[2]	AMOUNT	SULF[1]	ASH[2]
COLUMN 1	2	3	4	5	6	7	8	9	10	11	12	13	14

BASELINE CALCULATION LEVEL ______

DATA SOURCES ______

PROJECTION CALCULATION LEVEL ______

NOTES:

1. COAL AND OIL ONLY
2. COAL ONLY
3. TOTAL FUEL OF EACH TYPE BURNED BY ALL PLANTS

Table 4.2
Projected Electricity Generation

YEAR	ELECTRICITY GENERATED, MWH	FUELS	INTERNAL/ EXTERNAL	FRACTION USED	CONVERSION FACTOR	CALCULATED FUEL USE	PER-CENT SULFUR	PER-CENT ASH	PERCENT REDUCTION OF EMISSIONS REQUIRED IN PROJECTION YEARS*				
									PART	SOX	NOX	HC	CO
	COLUMN 1	2	3	4	5	6	7	8	9	10	11	12	13
1979	1000	Bituminous coal Residual oil	ext ext	75% 25%	(tons/mwh) (gal/mwh)	(tons) (gallons)							
▨	▨												
▨	▨												
▨	▨												
▨	▨												

CALCULATION LEVEL ________________

DATA SOURCES ________________

*GIVEN BY: (1–EQUIVALENT CONTROL EFFICIENCY)

Table 5.1
Baseline Solid Waste Disposal

(TONS BURNED PER YEAR)

SOURCE	TYPE	OPEN BURNING	INCINERATION	APARTMENT	AUTO BODY INCINERATION	OTHER
GOVERNMENT	POINT			▨	▨	
INDUSTRIAL	POINT			▨		
	AREA			▨	▨	▨
COMMERCIAL/ INSTITUTIONAL	POINT				▨	
	AREA			▨	▨	▨
RESIDENTIAL	AREA			▨	▨	▨

CALCULATION LEVEL ______
DATA SOURCES ________________

Table 5. 2
Projections for Solid Waste Disposal

(TONS BURNED PER YEAR)

SOURCE	TYPE	GROWTH FACTOR	OPEN BURNING	INCINERATION	APARTMENT	AUTO BODY INCINERATION	OTHER
GOVERNMENT	POINT				▨	▨	
INDUSTRIAL	POINT				▨		
	AREA				▨	▨	▨
COMMERCIAL/ INSTITUTIONAL	POINT					▨	
	AREA				▨	▨	▨
RESIDENTIAL	AREA				▨	▨	▨

CALCULATION LEVEL ______

DATA SOURCES ______

PROJECTION YEAR ______

Table 6. 1
Activity Producing Evaporation Emissions, Baseline and Projections

		BASELINE	PROJECTIONS		
SOURCE	UNITS	YR ______	YR ______	YR ______	YR ______
GASOLINE	GALLONS				
SOLVENTS	TONS				

BASELINE CALCULATION LEVEL ________
PROJECTION CALCULATION LEVEL ________
DATA SOURCES ____________________

Table 6.2

Miscellaneous Area Source Emissions, Baseline and Projections

SOURCE CATEGORY		YEAR ____				YEAR ____				YEAR ____				YEAR ____			
		ACTIVITY LEVEL	UNITS	EMISSION FACTOR	EMISSIONS [1]	ACTIVITY LEVEL	UNITS	EMISSION FACTOR	EMISSIONS [1]	ACTIVITY LEVEL	UNITS	EMISSION FACTOR	EMISSIONS [1]	ACTIVITY LEVEL	UNITS	EMISSION FACTOR	EMISSIONS [1]
SOLVENT EVAPORATION	INDUSTRIAL SOURCES (AREA)																
	DRY CLEANING																
FIRES	STRUCTURAL																
	FROST CONTROL																
	SLASH BURNING																
	WILD FOREST																
	AGRICULTURAL																
DUST CAUSED BY HUMAN AGITATION OF THE AIR	UNPAVED ROADS																
	UNPAVED AIRSTRIPS																
	PAVED ROADS																
	MINERAL PROCESSING																
	TILLING ACTIVITIES																
	LOADING CRUSHED ROCK, SAND, GRAVEL																
	CONSTRUCTION																
AIRBORNE DUST CAUSED BY NATURAL WINDS	STORAGE PILES																
	TILLED LAND																
	UNTILLED LAND																

[1] TONS PER YEAR

Table 7.1
County Base Year Emissions Report

COUNTY ____________
YEAR __________

SOURCE				EMISSIONS, TONS PER YEAR				
				PART	SOX	NOX	HC	CO
FUEL COMBUSTION: EXTERNAL	RESIDENTIAL FUEL (AREA)	ANTHRACITE COAL						
		BITUMINOUS COAL						
		DISTILLATE OIL						
		RESIDUAL OIL						
		NATURAL GAS						
		WOOD						
		TOTAL						
	ELECTRIC GENERATION (POINT)	ANTHRACITE COAL						
		BITUMINOUS COAL						
		LIGNITE						
		RESIDUAL OIL						
		DISTILLATE OIL						
		NATURAL GAS						
		PROCESS GAS						
		COKE						
		SOLID WASTE/COAL						
		TOTAL						
	INDUSTRIAL FUEL	ANTHRACITE COAL	AREA					
			POINT					
		BITUMINOUS COAL	AREA					
			POINT					
		LIGNITE	POINT					
		RESIDUAL OIL	AREA					
			POINT					
		DISTILLATE OIL	AREA					
			POINT					
		NATURAL GAS	AREA					
			POINT					
		PROCESS GAS	AREA					
			POINT					
		COKE	POINT					
		WOOD	AREA					
			POINT					
		LIQUID PETROL GAS	POINT					
		BAGASSE	POINT					
		OTHER	POINT					
		TOTAL	AREA					
			POINT					

Table 7.1
Continued

SOURCE				PART	SOX	NOX	HC	CO
FUEL COMBUSTION: EXTERNAL (CONTINUED)	COMMERCIAL-INSTITUTIONAL FUEL	ANTHRACITE COAL	AREA					
			POINT					
		BITUMINOUS COAL	AREA					
			POINT					
		LIGNITE	POINT					
		RESIDUAL OIL	AREA					
			POINT					
		DISTILLATE OIL	AREA					
			POINT					
		NATURAL GAS	AREA					
			POINT					
		WOOD	AREA					
			POINT					
		LIQUID PETROL GAS	POINT					
		OTHER	POINT					
		TOTAL	AREA					
			POINT					
	OTHER		POINT					
	TOTAL EXTERNAL COMBUSTION		AREA					
			POINT					
FUEL COMBUSTION: INTERNAL	ELECTRIC GENERATION	DISTILLATE OIL						
		NATURAL GAS						
		DIESEL						
		OTHER						
		TOTAL						
	INDUSTRIAL FUEL	DISTILLATE OIL						
		NATURAL GAS						
		GASOLINE						
		DIESEL						
		OTHER						
		TOTAL						
	COMMERCIAL-INSTITUTIONAL FUEL	DIESEL						
		TOTAL						
	ENGINE TESTING	AIRCRAFT						
	TOTAL INTERNAL COMBUSTION							
TOTAL FUEL COMBUSTION		AREA						
		POINT						

Table 7.1
Continued

Table 7.1
Continued

SOURCE				PART	SOX	NOX	HC	CO
INDUSTRIAL PROCESS (POINT)	CHEMICAL MANUFACTURING							
	FOOD/AGRICULTURE							
	PRIMARY METAL							
	SECONDARY METALS							
	MINERAL PRODUCTS							
	PETROLEUM INDUSTRY							
	WOOD PRODUCTS							
	PROCESS EVAPORATION							
	METAL FABRICATION							
	LEATHER PRODUCTS							
	TEXTILE MANUFACTURING							
	INPROCESS FUEL							
	OTHER/NOT CLASSIFIED							
	TOTAL							
SOLID WASTE DISPOSAL	GOVERNMENT (POINT)	MUNIC. INCIN.						
		OPEN BURNING						
		OTHER						
		TOTAL						
	RESIDENTIAL (AREA)	ON-SITE INCIN.						
		OPEN BURNING						
		TOTAL						
	COMMERCIAL-INSTITUTIONAL	ON-SITE INCINERATION	AREA					
			POINT					
		OPEN BURNING	AREA					
			POINT					
		APARTMENT	POINT					
		OTHER	AREA					
			POINT					
		TOTAL	AREA					
			POINT					
	INDUSTRIAL	ON-SITE INCINERATION	AREA					
			POINT					
		OPEN BURNING	AREA					
			POINT					
		AUTO BODY INCIN.	POINT					
		OTHER	POINT					
		TOTAL	AREA					
			POINT					
	TOTAL SOLID WASTE DISPOSAL		AREA					
			POINT					

Table 7.1
Continued

SOURCE				PART	SOX	NOX	HC	CO
TRANSPORTATION (AREA)	LAND VEHICLES	GASOLINE	LIGHT DUTY					
			HEAVY DUTY					
			OFF HIGHWAY					
			TOTAL					
		DIESEL	HEAVY DUTY					
			OFF HIGHWAY					
			RAIL					
			TOTAL					
	AIRCRAFT	MILITARY						
		CIVIL						
		COMMERCIAL						
		TOTAL						
	VESSELS	BITUMINOUS COAL						
		DIESEL FUEL						
		RESIDUAL OIL						
		GASOLINE						
		TOTAL						
	GAS HANDLING EVAPORATION LOSS							
	TOTAL TRANSPORTATION							

Table 7.1
Continued

SOURCE			PART	SOX	NOX	HC	CO
MISCELLANEOUS (AREA)	SOLVENT EVAPORATION	INDUSTRIAL SOURCES (AREA)					
		DRY CLEANING					
	FIRES	STRUCTURAL					
		FROST CONTROL					
		SLASH BURNING					
		WILD FOREST					
		AGRICULTURAL					
	DUST CAUSED BY HUMAN AGITATION OF THE AIR	UNPAVED ROADS					
		UNPAVED AIRSTRIPS					
		PAVED ROADS					
		MINERAL PROCESSING					
		TILLING ACTIVITIES					
		LOADING CRUSHED ROCK, SAND, GRAVEL					
		CONSTRUCTION					
	AIRBORNE DUST CAUSED BY NATURAL WINDS	STORAGE PILES					
		TILLED LAND					
		UNTILLED LAND					
GRAND TOTAL	AREA						
	POINT						

Table 7.2
Projected County Emissions Report

COUNTY ________________
YEAR ________________

SOURCE				EMISSIONS, TONS PER YEAR				
				PART	SOX	NOX	HC	CO
FUEL COMBUSTION: EXTERNAL	RESIDENTIAL FUEL (AREA)	ANTHRACITE COAL						
		BITUMINOUS COAL						
		DISTILLATE OIL						
		RESIDUAL OIL						
		NATURAL GAS						
		WOOD						
		TOTAL						
	ELECTRIC GENERATION (POINT)	ANTHRACITE COAL						
		BITUMINOUS COAL						
		LIGNITE						
		RESIDUAL OIL						
		DISTILLATE OIL						
		NATURAL GAS						
		PROCESS GAS						
		COKE						
		SOLID WASTE/COAL						
		TOTAL						
	INDUSTRIAL FUEL	ANTHRACITE COAL	AREA					
			POINT					
		BITUMINOUS COAL	AREA					
			POINT					
		LIGNITE	POINT					
		RESIDUAL OIL	AREA					
			POINT					
		DISTILLATE OIL	AREA					
			POINT					
		NATURAL GAS	AREA					
			POINT					
		PROCESS GAS	AREA					
			POINT					
		COKE	POINT					
		WOOD	AREA					
			POINT					
		LIQUID PETROL GAS	POINT					
		BAGASSE	POINT					
		OTHER	POINT					
		TOTAL	AREA					
			POINT					

Table 7.2
Continued

SOURCE				PART	SOX	NOX	HC	CO
FUEL COMBUSTION EXTERNAL (CONTINUED)	COMMERCIAL INSTITUTIONAL FUEL	ANTHRACITE COAL	AREA					
			POINT					
		BITUMINOUS COAL	AREA					
			POINT					
		LIGNITE	POINT					
		RESIDUAL OIL	AREA					
			POINT					
		DISTILLATE OIL	AREA					
			POINT					
		NATURAL GAS	AREA					
			POINT					
		WOOD	AREA					
			POINT					
		LIQUID PETROL GAS	POINT					
		OTHER	POINT					
		TOTAL	AREA					
			POINT					
	OTHER		POINT					
	TOTAL EXTERNAL COMBUSTION		AREA					
			POINT					
FUEL COMBUSTION INTERNAL	ELECTRIC GENERATION	DISTILLATE OIL						
		NATURAL GAS						
		DIESEL						
		OTHER						
		TOTAL						
	INDUSTRIAL FUEL	DISTILLATE OIL						
		NATURAL GAS						
		GASOLINE						
		DIESEL						
		OTHER						
		TOTAL						
	COMMERCIAL INSTITUTIONAL FUEL	DIESEL						
		TOTAL						
	ENGINE TESTING	AIRCRAFT						
	TOTAL INTERNAL COMBUSTION							
TOTAL FUEL COMBUSTION		AREA						
		POINT						

Table 7.2
Continued

Table 7.2
Continued

SOURCE				PART	SOX	NOX	HC	CO
INDUSTRIAL PROCESS (POINT)	CHEMICAL MANUFACTURING							
	FOOD/AGRICULTURE							
	PRIMARY METAL							
	SECONDARY METALS							
	MINERAL PRODUCTS							
	PETROLEUM INDUSTRY							
	WOOD PRODUCTS							
	PROCESS EVAPORATION							
	METAL FABRICATION							
	LEATHER PRODUCTS							
	TEXTILE MANUFACTURING							
	INPROCESS FUEL							
	OTHER/NOT CLASSIFIED							
	TOTAL							
SOLID WASTE DISPOSAL	GOVERNMENT (POINT)	MUNIC. INCIN.						
		OPEN BURNING						
		OTHER						
		TOTAL						
	RESIDENTIAL (AREA)	ON-SITE INCIN.						
		OPEN BURNING						
		TOTAL						
	COMMERCIAL-INSTITUTIONAL	ON-SITE INCINERATION	AREA					
			POINT					
		OPEN BURNING	AREA					
			POINT					
		APARTMENT	POINT					
		OTHER	AREA					
			POINT					
		TOTAL	AREA					
			POINT					
	INDUSTRIAL	ON-SITE INCINERATION	AREA					
			POINT					
		OPEN BURNING	AREA					
			POINT					
		AUTO BODY INCIN	POINT					
		OTHER	POINT					
		TOTAL	AREA					
			POINT					
	TOTAL SOLID WASTE DISPOSAL		AREA					
			POINT					

Table 7.2
Continued

Table 7.2
Continued

SOURCE				PART	SOX	NOX	HC	CO
TRANSPORTATION (AREA)	LAND VEHICLES	GASOLINE	LIGHT DUTY					
			HEAVY DUTY					
			OFF HIGHWAY					
			TOTAL					
		DIESEL	HEAVY DUTY					
			OFF HIGHWAY					
			RAIL					
			TOTAL					
	AIRCRAFT	MILITARY						
		CIVIL						
		COMMERCIAL						
		TOTAL						
	VESSELS	BITUMINOUS COAL						
		DIESEL FUEL						
		RESIDUAL OIL						
		GASOLINE						
		TOTAL						
	GAS HANDLING EVAPORATION LOSS							
	TOTAL TRANSPORTATION							

Table 7.2
Continued

SOURCE			PART	SOX	NOX	HC	CO
MISCELLANEOUS (AREA)	SOLVENT EVAPORATION	INDUSTRIAL SOURCES (AREA)					
		DRY CLEANING					
	FIRES	STRUCTURAL					
		FROST CONTROL					
		SLASH BURNING					
		WILD FOREST					
		AGRICULTURAL					
	DUST CAUSED BY HUMAN AGITATION OF THE AIR	UNPAVED ROADS					
		UNPAVED AIRSTRIPS					
		PAVED ROADS					
		MINERAL PROCESSING					
		TILLING ACTIVITIES					
		LOADING CRUSHED ROCK, SAND, GRAVEL					
		CONSTRUCTION					
	AIRBORNE DUST CAUSED BY NATURAL WINDS	STORAGE PILES					
		TILLED LAND					
		UNTILLED LAND					
GRAND TOTAL	AREA						
	POINT						

Table 7.2
Continued